Subterranea

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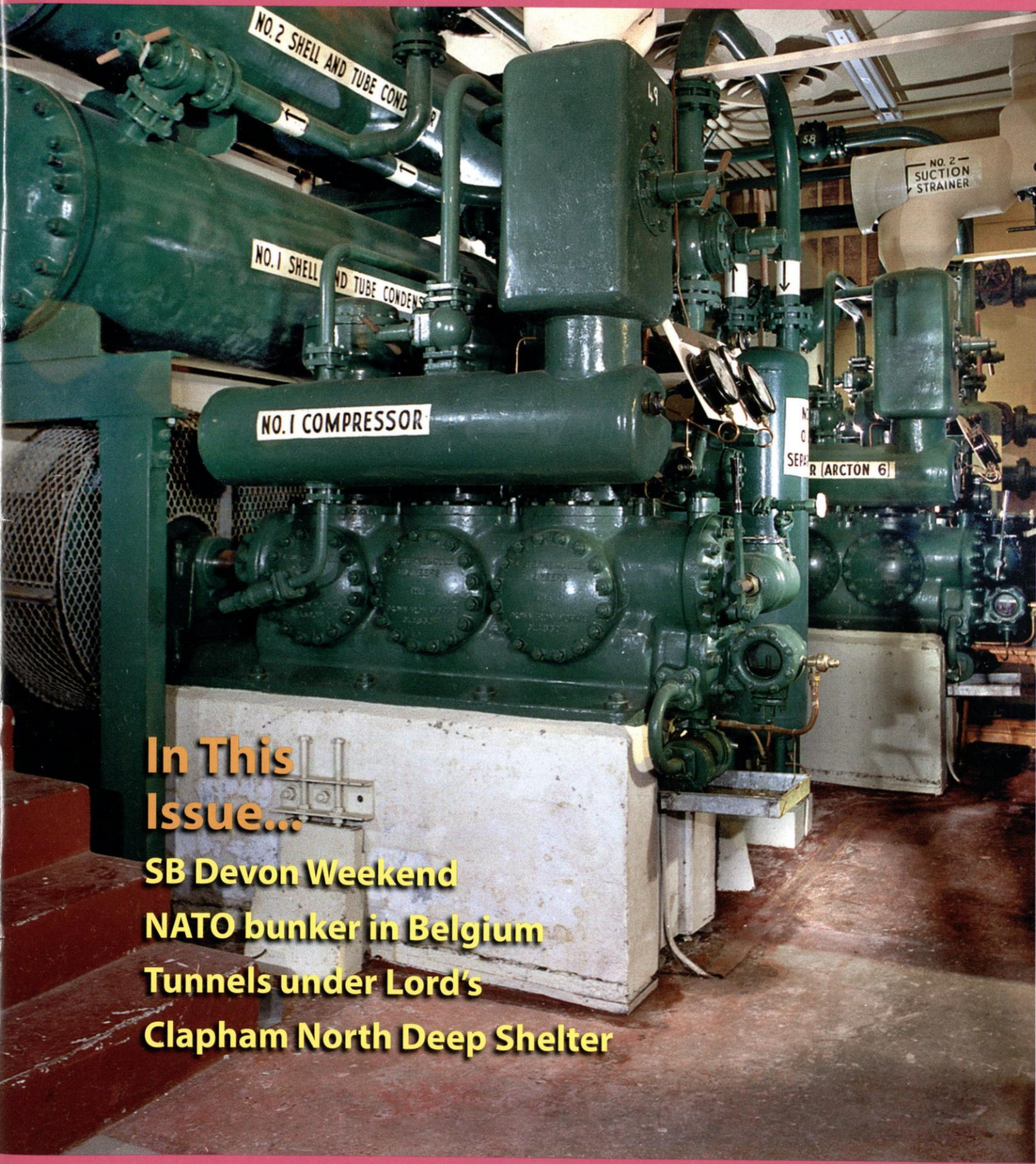

In This Issue...

SB Devon Weekend

NATO bunker in Belgium

Tunnels under Lord's

Clapham North Deep Shelter

Subterannea Britannica

www.subbrit.org.uk

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life. Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.

Editor: Nick Catford 13 Highcroft Cottages London Road Swanley Kent BR8 8DB
e-mail editor@subbrit.org.uk

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Front cover photo: The air-conditioning plant room at the Hope Cove GCI ROTOR radar station has two 3-cylinder compressors. These compress the refrigerant (originally the toxic anaesthetic liquid, Methyl Chloride). Mounted on the wall on the left there are two cylindrical horizontal tanks where the cooled water from the air-cooled heat exchangers cools and condenses the refrigerant. Photo Nick Catford

Back page upper: The now derelict Paddock map room after two feet of water was pumped out. Photo Nick Catford

Back page lower: The 47 attendees of the Devon Study Weekend underground at Beer Quarry. The group is standing in front of one of the last working faces in the quarry. Photo Dom Jackson

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Editor of *Subterranea*: Nick Catford
Editorial Assistants: Martin Dixon & Linda Dixon
Layout: Martin Snow
Graphics: Tim Robinson
Proofreading : Stewart Wild

Committee
Mark Russell : Trip Coordinator
Richard Seabrook: Webmaster
Andrew Smith : PR
Chris Rayner: SB Meetings
Paul W. Sowan
Bob Templeman
Richard West

Newsletters of Subterranea Britannica are published by the committee of Subterranea Britannica. Original articles, book reviews, press cuttings, extracts from books and journals, letters to the Editor etc are welcome. However the Editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Martin Dixon

A very Happy Birthday to Subterranea Britannica! 2014 marks forty years since our formation, during which we've had thousands of members and collectively visited thousands of sites. Sadly some of our members and many sites are no longer with us but the memories, as they say, live on.

A flyer in this edition of *Subterranea* invites members to a celebration that we are holding in London on June 7 to celebrate this milestone. The venue is the original construction shaft of the world's first underwater tunnel. The geology proved far from ideal and Isambard Brunel was lucky to survive after being washed into the same shaft in 1828 after the tunnel workings were inundated with flood water. Hopefully our own evening will be far less dramatic and I look forward to seeing many of you there.

Many things have changed over the years but from our earliest days visits to sites have been an important and valued part of Sub Brit's activities. Many thanks to those who have set up trips – lots are already happening in 2014. Organising visits can be great fun and in response to a couple of requests I've written some thoughts and guidelines which appear elsewhere in the magazine. If only five percent of members organised one trip a year then that would add up to more than one trip a week for the entire year.

As I write this column, we are making the final arrangements for our study weekend to the Czech Republic. Forty-five members are booked up for the weekend and sites planned range from a mediaeval silver mine to an underground Cold War fuel store. As usual, we are fortunate to have received invaluable assistance from local enthusiasts who as well as knowing potential underground sites suitable for large groups also 'speak the lingo'.

A plea to those members who travel overseas as part of their passion – please promote Subterranea Britannica and encourage local residents to visit our website and hopefully sign up as members. The wider our network, the easier it becomes to arrange visits to new and fascinating sites. Six months ago we were contemplating holding our May weekend in the Ukraine. Given recent events, it's perhaps fortunate the proposal didn't get taken forward!

Later this year we plan to produce a short commemorative history of Sub Brit. If any readers have any stories, snippets or photos that they would like to be included then please get in touch. To those new members reading their first *Subterranea* – a special welcome; I recognise you may not have anything to share as yet – but you'll get your chance in another forty years!

chairman@subbrit.org.uk

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events 2014

Sub Brit specific events

17 - 18 May SB at Fawley Hill Steam Extravaganza
22 May Paddock open day
29 May SB special tour of Aldwych disused Underground Station
7 June SB 40th Birthday celebration at the Brunel Museum
14 June SB Committee meeting
1 July Copy deadline for *Subterranea* 36
Mid-August *Subterranea* 36 published
20 September Paddock open day
11 - 12 October SB Autumn meeting Newcastle
18 October SB Committee meeting
1 November Copy deadline for *Subterranea* 37
Mid-December *Subterranea* 37 published

Other underground-related events

10 May, 14 June, 12 July, 9 August, 13 September Reigate Caves public open days
11, 25 May, 8, 22 June, 13, 27 July, 10, 24 August, 14, 28 September, 12 October Canal Boat trip from London Canal Museum through London's longest tunnel
18 May Second World War walk at National Trust Coleshill
24 May Sussex Military History Society study day – The Great War, Newhaven Fort
5 – 29 June Aldwych Underground Station tours by London Transport Museum
12 – 27 July Festival of British Archaeology
12 – 13 July, 30, 31 August, 13 September Cuckfield ROC Post open days

For more up-to-date information, please visit www.subbrit.co.uk/events or contact the Society concerned

25 - 27 July NAMHO Conference Gwynedd
26 - 29 August Royal Geographical Society conference on Cold War Bunkers
6 - 28 September Doors Open Days, Scotland www.doorsopendays.org.uk
11 - 14 September Heritage Open Days www.heritageopendays.org.uk
13 - 14 September European Heritage Open Days, Northern Ireland
20 - 21 September Open House, London www.londonopenhouse.org.uk
September (tbc) Open Doors, Wales www.opendoorsdays.org.uk
11 - 12 October SFES weekend Congress, France

If you know of other relevant events run by other societies, please let us know so that they can be advertised in the next edition and on the website

Notes of SB Committee Meeting 18 January 2014

Chairman

A meeting had been held with representatives of Sotterranei di Roma to discuss closer collaboration, and talks were on-going. The Chairman had also been in touch with both BBC TV and radio about possible contributions to forthcoming programmes dealing with the underground. Andrew Smith reported that two television programmes had been broadcast in which he had been interviewed on behalf of Subterranea Britannica.

Finance

The Chairman said that the Annual Return had been made to Companies House. Following a proposal from the Chairman, the committee agreed to adjust the Subterranea Britannica policy on reserves to cover between 6 and 18 months of total income. The Treasurer reported that Subterranea Britannica finances were in a satisfactory position, due to the increase in subscriptions, using a cheaper printer for *Subterranea*, Gift Aid and shop sales. New projects awaiting funding included a leaflet for Cuckfield ROC post, and information panels for Camden Tunnels and Brede Waterworks. A donation would be made to the Brunel Museum, and the committee agreed to publicise the continued availability of funding for appropriate projects.

Subterranea

Nick Catford reported that a new printer was now printing *Subterranea*, and that substantial savings in costs had been achieved without any compromise on quality. *Subterranea* 22 (Corsham) – had been reprinted and was on sale through the Subterranea Britannica online shop.

Meetings & Visits

The Chairman said that he and Linda had been working on arrangements for the Prague weekend visit in May, but had been frustrated by the lack of communication received from their contacts. The visit was fully booked, with a waiting list, and it was hoped that arrangements could be finalised in the near future. Chris Rayner reported that all arrangements for the Spring Meeting had been finalised and those for Autumn 2014 in Newcastle were on track. The proposed UK Study Weekend to the Forest of Dean/Gloucestershire had not been possible to arrange, however we would still have a day of visits in Newcastle, after the Autumn Meeting. The possibility of visits to France and Poland in the Autumn of this year was being investigated. The visit to Brompton Road underground station had been successful, and future visits were being arranged to Fort Widley and Brede Bunker. Other potential sites were also being investigated.

Membership

Following the introduction of the new renewal process using CiviCRM, more than half of last year's members (over 500) had renewed within 10 days – despite some initial glitches in the system. The majority of members were using PayPal, and this was now the preferred method.

40th Anniversary

The Chairman reported that the celebration dinner would be held at the Brunel Museum in London on Saturday 7 June. All members would be invited. Detailed arrangements were discussed by the committee, and booking would be through a flyer with the next issue of *Subterranea*. The special eight-page supplement, covering highlights of the last forty years, would be published with *Subterranea* this year.

The next committee meeting will be held on Saturday 14 June 2014; any members wishing to raise any matter should do so in writing to the Secretary at least two weeks before.

Roger Starling, Secretary

Sub Brit on eBay

Readers may be interested to know that we have recently registered Subterranea Britannica on eBay as an 'eBay for Charity' partner. This means that anyone can nominate Sub Brit to receive a percentage (between 10 and 100%) of the proceeds of any eBay sale. More general information is on the eBay website

Our own home page from which you can initiate a sale is at:
http://donations.ebay.co.uk/charity/charity.jsp?NP_ID=64157
There's no pressure to do so but any money received will, of course, be used for our charitable ends

NEWS

Miscellany compiled by Paul Sowan and Nick Catford

NEWS – ARCHAEOLOGY

Traces of Neanderthal Man reported from St Brelade Cave, Jersey

Archaeologists working on cave stabilisation on Jersey have reported finding cave deposits thought to have been wholly destroyed by previous excavations. Sediments dating from the Ice Age have been found to contain a quarter of a million years' worth of recorded climate change. The cave, La Cotte de St Brelade, has yielded more Neanderthal stone tools than the rest of the British Isles put together, including the only known materials of this date found in northwestern Europe. Part of the sedimentary sequence dates from 100,000 to 47,000 years ago, implying that Neanderthal teeth discovered at this site in 1910 are younger than was then thought. This site may represent the home of the last Neanderthals in the region.

SOURCE: POPE, Matt, 2013, Lost home of last Neanderthals rediscovered in Britain. *Planet Earth,* Winter 2013, page 6 [Abstract from the *Journal of Quaternary Science*]

Charles Dawson, the Piltdown 'Man', underground in Sussex

The centenary of the publication by Charles Dawson [1864–1916] and Arthur Smith Woodward of the Piltdown forgery (not definitively exposed as such until 1953) was 'celebrated' in 2013. Although Dawson was a member of the Sussex Archaeological Society, and made the obscure hamlet near Uckfield arguably the best-known Sussex place-name worldwide (Hastings would be the runner-up; Gatwick Airport has only relatively recently been relocated from Surrey), Dawson's 'discovery' was comprehensively ignored in the Society's journal and in its archaeological museum in Lewes until last year. Whilst there is no conclusive proof that Dawson was the guilty party, he remains the prime suspect out of 30 or so suggested culprits: Piltdown has been a fertile source of 'whodunit' books, rich in guesswork and light on evidence.

Miles Russell in 2009 published a study of Dawson's other geological and archaeological discoveries, not a few of which have turned out to be 'discoveries' of faked fossils and artefacts. And his published work has, on close examination, been held to be in significant part plagiarised.

It is not widely known that Dawson's archaeological interests extended underground. He claimed to have descended deneholes on the Sussex downs near Brighton (but failed to record their exact locations). He claimed to have seen a 'Turin shroud' image of a man hanging by his wrists on a wall in the dungeons at Hastings Castle. He published a paper on 'Ancient and modern deneholes' near Brightling in East Sussex, likening the vertical-shaft mines for Jurassic limestone (still being worked in his day) to the familiar chalk deneholes of Kent and Essex. And he excavated in the Lavant 'caves' north of Chichester.

John Farrant has now thoroughly examined these and other of Dawson's activities (and arguably in some cases hoaxes and plagiarisms) culminating in *Piltdown Man*, the results being published in the Society's journal. This is almost the first time his name has appeared in print in the journal since 1912! Excavations in the enigmatic 'caves' in chalk in the Lavant valley are examined in considerable detail. These were discovered by accident in the early 1890s, and explored and excavated by Dawson and John Lewis in January and February 1893.

Remarkably poorly recorded field notes and some photographs and sketch plans of the cave have been located and now published in the journal, but there was never a formally published archaeological report in the 1890s. An astonishing variety of artefacts was recovered, from prehistoric to post-medieval. To what extent any of this was an early Dawson hoax cannot now be determined: but it certainly constitutes an outstanding example of sloppy archaeological fieldwork and recording. Although the landowner went to the trouble of constructing steps down and a 'stable' entrance to these 'caves', they are now thought to be fallen in and inaccessible.

This is an interesting sidelight on Piltdown, and addition to the literature of underground Sussex. The age and original purpose of the Lavant 'Caves' remain undetermined.

SOURCES: FARRANT, John H., 2013, Prelude to Piltdown: Charles Dawson's origins, career and antiquarian pursuits, 1864–1911, and their repercussions. *Sussex Archaeological Collections* 151;

and RUSSELL, Miles, 2009, *Piltdown Man: the secret life of Charles Dawson & the World's greatest archaeological hoax.* Tempus Publishing Ltd: 288 pages [ISBN 0-7524-25722]

NEWS – CONSERVATION AND HERITAGE

New mine tour at Llechwedd Slate Caverns opens in 2014

Llechwedd Slate Caverns at Blaenau Ffestiniog in North Wales have announced that they are creating a new heritage tour for the 2014 season. Combining the best of the existing Tramway and Deep Mine Tours, the new tour will begin at the same point as the existing deep mine tour and finish in the Old Mill where the Tramway Tour currently concludes.

Michael Bewick who heads the Llechwedd team said:

"We are responding to customer feedback – people love our tours but want more. They also love the guides which is why this new tour is guided throughout."

The new tour will include the tour of the spectacular caverns, stories of life for Victorian Miners and their families, demonstrations of the tools they used and some great new effects including a chance to start a blast! Because all tours will be guided there will be more employment. The museum is also opening up more caverns underground so visitors will be able to see even more of the quarry workings.

Visitors enjoying the tramway tour

Llechwedd has suffered dropping visitor numbers for over ten years to the point where the future of the site was in jeopardy. This new initiative should see visitor numbers climbing back again and secure Llechwedd and its underground tour for generations into the future.

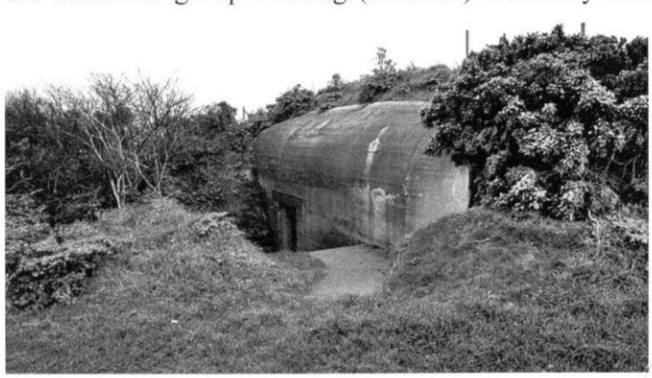
SOURCE: Llechwedd Slate Caverns press release

Guernsey WWII bunker to open to the public

A well-preserved World War II bunker in Guernsey will open to the public in the spring. The bunker was built by the German occupying forces as part of Hitler's Atlantic Wall, which aimed to stop any Allied invasion of Europe. A range-finding mural and fixtures remain in place in the structure that originally housed an anti-tank gun.

The bunker has remained in unusually good condition. The doors, grilles, German writing and electrical fittings can all still be seen. Although the bunker was open for quite some time after the war allowing people to come in and out, for some reason it was left alone.

The bunker was eventually sealed by filling in the entrance. This has now been excavated by members of the historical group Festung (Fortress) Guernsey and some restoration has been carried out internally. Its members will open the bunker and provide information about other defences along Belle Greve Bay during the Visit Guernsey military-themed Heritage Week in May.



SOURCE: *BBC News – Guernsey,* 25 February 2014

Newly designated heritage assets in England in 2012–13

The first issue of a new English Heritage publication featuring selected additions to the Schedules of Ancient Monuments, Listed Buildings, Parks and Gardens, Battlefields and Protected Wrecks has been published. Scheduled Ancient Monuments have been designated for official protection from the 1882 *Ancient Monuments Act* (including man-made or used underground spaces), and this new publication celebrates the 100th anniversary of the *Ancient Monuments Consolidation and Amendment Act* of 1913.

There were at the end of the year 2013 reported (in England) 397,226 'designated heritage assets' comprising 19,792 Scheduled Ancient Monuments; 375,719 Listed Buildings; 1,624 Parks and Gardens, 43 Battlefields, and 48 Protected Wrecks. Others of course are in Scotland and Wales.

Additions during the year were 44 monuments, 403 buildings, seven parks and gardens, and one more protected wreck. Brief illustrated accounts deal with, *inter alia*, Pulhamite (artificial stone) 'cliffs' at Bawdsey (Suffolk); a public air-raid shelter and gas decontamination centre at Ipswich (Suffolk); Butterley ironworks (including part of a canal tunnel) at Ripley (Derbyshire); ten lead mines in the Peak District; the Manchester & Salford Junction Canal tunnel / air-raid shelters at Manchester; an anti-aircraft operations room at Frodsham (Cheshire); and MoD Corsham (Wiltshire). It is good to reflect that Subterranea Britannica's decades of advocating the Scheduling of underground sites is at last being rewarded!

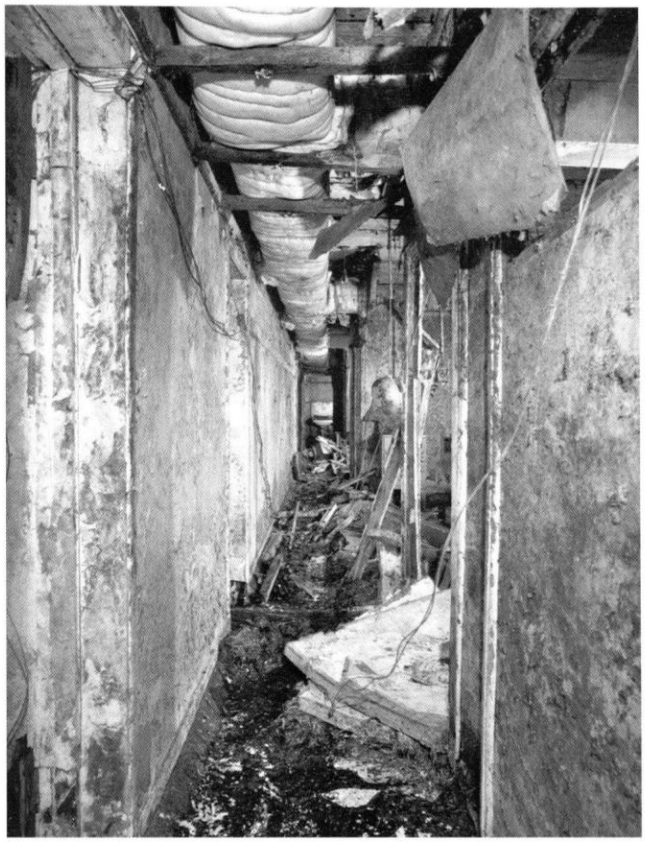
SOURCE: ENGLISH HERITAGE, 2013, *New highlights from the National Heritage List for England: Designation Year Book for 2012–2013.* English Heritage: 70pp.

Campaign to preserve Camden's Cold War control centre

An underground nuclear bunker that was Camden's borough control centre during the Cold War era has stood empty for decades hidden in a park. The bunker, which stands at the junction of Gordon House Road and Highgate Road in Dartmouth Park was built about 1953 and was part of the North West Group. It was taken out of use when the Civil Defence Corps was disbanded in 1968 and the door was welded shut.

Now the Dartmouth Park Community Area Advisory Committee (DPCAAC) has launched a campaign for it to be saved and transformed into a community space. The group has nominated the bunker to be placed on Camden's Local List to preserve its heritage.

Patrick Lefevre, chairman of DPCAAC said: "It hasn't



The main corridor has suffered from water ingress and all internal walls are beyond saving. Photo Nick Catford

been opened or cleaned up in several years which has meant a steady deterioration. It has a great deal of potential for being a community space. Elsewhere in the country spaces like this have been turned into museums and listed by English Heritage, so we're very keen to see this particular bit of local history at least locally listed here."

Plans show the eight-room bunker included a control room, a plant room, conference room, as well as a kitchen, canteen and male and female toilets.

The council has placed the bunker on its regeneration list, but the area advisory committee fear this will not offer sufficient protection. Highgate councillor Sally Gimson is involved in the campaign for it to be locally listed and said the shelter needs to be "acknowledged, recognised and restored". She said: "It's part of our history in Camden. I think we should at least list it so it isn't just destroyed."

The bunker was visited by members of Sub Brit in 2002. At that time the council ground the welds off the door and fitted a new lock. The bunker is in a very poor condition internally due to water ingress. Many of the thin partition walls have collapsed along with doors and door frames: these lie on the floor of the rooms and in the corridor. It is unlikely that any of the partition walls can be saved. All the plant is intact comprising ventilation plant and trunking, standby generator and electrical switchgear.

SOURCE: *Ham & High,* 10 February 2014 and Sub Brit website:
www.subbrit.org.uk/rsg/sites/c/camden_control/index.html

Poldark Mine in administration and for sale for £350,000

Poldark Mine is to be sold-off after going into administration following the death of the owner Richard Williams in 2013. The long-running tourist attraction near Helston in Cornwall is being sold for a guide price of £350,000. It attracts around 18,000 visitors each year. Poldark's greatest attraction is an hour-long tour of the twisting tunnels of the 18th-century tin mine.

Poldark is one of two popular mining heritage sites in Cornwall. It was rescued from the receiver in 2000 by local mining heritage enthusiasts; Poldark receives no public funding support but is assisted by volunteers including Cornwall Mine Rescue Organisation.

Specialist property adviser Christie and Co has been instructed to sell the tin mine, which includes car park, museum, visitors' centre and cafe. The company is are hopeful that the sale will attract a variety of potential purchasers from throughout the UK, including investors and local individuals or residents keen to ensure the continuation of the attraction. They are already receiving interest from local residents and expect the marketing campaign to generate a high volume of interest.

The BBC is about to start filming a new adaptation of the 18th-century drama *Poldark* in Cornwall, so the Poldark Mine will have a whole new resonance for visitors, and potential buyers, in the 21st century. Poldark Mine is situated within the Wendron District of the Cornish Mining World Heritage Site.

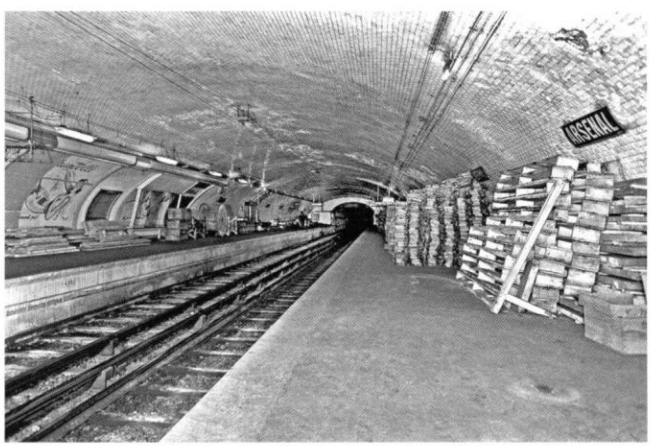
SOURCE: *West Briton,* 24 March 2014

Secondary uses for disused Paris Metro stations, France

Paris, like London, has a number of disused sub-surface stations on its underground railway network. Apart from unremunerative patronage (such as at Aldwych, where more money is now made hiring out the station for film and television work than was made selling tickets), there are other reasons for declaring stations redundant. For example, when a number of deep tunnelled stations in London first opened, they were served by lifts from the booking halls down to the platforms more or less vertically below the surface entrances.

Lifts being relatively slow (as those who use Covent Garden station will know), they have at many places been replaced by escalators up from the platforms, which (not rising vertically) call for the surface entrance to be displaced along the street, or two escalators installed, one doubling back on the other (relatively complex and expensive). This is why Covent Garden still has lifts.

In Paris there are 16 'ghost stations', most of them closed in 1939 and not reopened after the end of the war. A contender to be Mayor of Paris, Nathalie Kosciusko-Morizet of the centre-right UMP Party, has now suggested imaginative new uses for some of these closed stations. She suggests that Arsenal station, closed in 1939, might become a swimming pool, theatre, concert hall, art gallery, night-club or restaurant.



Built in 1906 in the 4th arrondissement of Paris and closed in 1936, Arsenal is today used as a sort of dumping ground by RATP (the transport operator of Paris) for testing equipment

Parisians are reportedly not over-impressed. And the report cited makes no mention of practicalities, such as closed stations' continuing roles for ventilation and emergency access, not to mention emergency escape routes and the introduction of sanitation for new users.

SOURCE: WILLSHIRE, Kim, 2014, Plan to revive Paris ghost stations. *The Guardian,* 8 February 2014

Ramsgate tunnels due to open to the public in June 2014

With the Second World War looming, and having suffered as the most raided place in Britain during the Great War, Ramsgate was acutely aware of the dangers of aerial attack and coastal shelling. The local authority embarked on ambitious plans to provide underground shelter from attack within five minutes' walk of every house.

Initially central government would not sanction these plans but thanks to a determined effort by the Mayor and local authority, permission was finally granted to construct nearly 2½ miles of tunnels 60 feet below the town with access from all major areas of population. These were the largest and only civilian air-raid protection tunnels to be sanctioned by government and their unique design was made possible due to the special geology of the town.

Bunks closely spaced in the narrow chalk-cut tunnels during WWII

The tunnel design incorporated a former Victorian railway tunnel of almost one mile in length which meant the complex was capable of sheltering up to 60,000 people.

During the first Blitz of any town in Britain, Ramsgate suffered over 500 bombs in less than five minutes, completely devastating whole areas of the town. Remarkably, thanks to the safety of the tunnels, only 28 civilians lost their lives in this raid but almost 1,000 people were rendered homeless. Many of the homeless moved the remains of their possessions into the former railway tunnel and took up permanent residence, some remaining below ground until war ended. Despite its location close to occupied France, Ramsgate was one of the safest towns in Britain.

From the arrival of the railway and through the devastation of World War II, Ramsgate's tunnels were one of the town's most important assets.

In 2011 Ramsgate's Mayor, Cllr David Green, formed the Ramsgate Tunnels Heritage Group to assess the viability of reopening the tunnels as an all-weather visitor attraction. A bid was made by Ramsgate Town Council for Lottery funding via the Jubilee People's Millions to provide various studies to assess the true condition of the tunnels and assess the feasibility of opening them to the public. Ramsgate Town Council won their bid for £53,000 with the highest vote in the Meridian East region. In February 2013 Thanet District Council awarded the project a grant of £20,000.

Towards the end of 2013 the Ramsgate Heritage Regeneration Trust was in the final stages of negotiating with Thanet District Council to take control of the tunnels with an agreement being signed that will safeguard the interests of all parties. Work started at the end of January to prepare the tunnels for public tours. The Ramsgate Tunnel deep shelter system was first opened by H.R.H. The Duke of Kent on 1 June 1939. A target date has now been set for the tunnels to reopen for Explorer tours on 1 June 2014, exactly 75 years after their first opening.

SOURCE: *Tunnel Times,* December 2013 (Newsletter of the Ramsgate Tunnels Heritage Group)

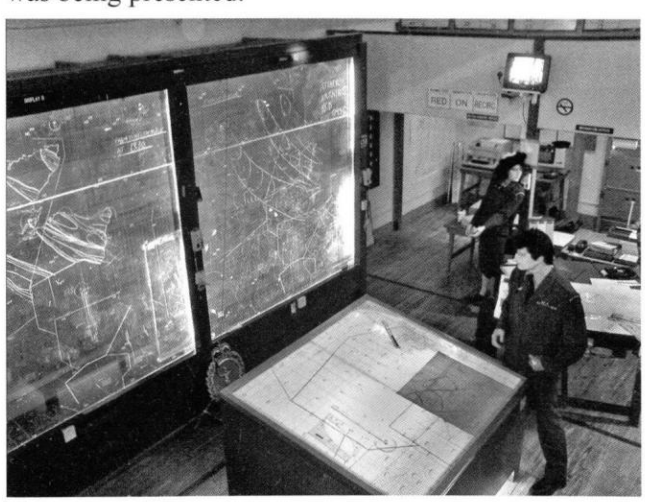
Anstruther ROTOR bunker celebrates 20 years with refurbishment

Scotland's 'Secret Bunker', the former R3 GCI Rotor bunker and North Zone headquarters, reopened to the public in February 2014 after undergoing an extensive restoration project over the winter months. The Cold War museum, near St Andrews in Fife, closed for the winter and has carried out extensive refurbishment ahead of its 20th Anniversary celebrations this year.

Opened to the public in 1994, after being decommissioned in the late 1980s following the collapse of the Soviet Union, the bunker is now one of Fife's major tourist attractions welcoming tens of thousands of visitors through its blast doors every year.

One room which has been extensively remodelled is the British Telecom equipment room where unseen areas have now been revealed, allowing Cold War (and, indeed, telecoms) enthusiasts to see the specialist communications equipment which was in operation to distribute the 2800 phone lines connected to the bunker, and which would have been the main line of communication with the outside world in the event of a nuclear attack on Scotland.

James Mitchell, managing director, commented: "We are really excited about our 20th anniversary year and to be reopening this spring with a fresh look to all our exhibits. Over the years we have had many artefacts given to us, or have acquired them from other decommissioned bunkers, and we felt it was time for a fresh look at how everything was being presented.



The Royal Observer Corps control room

"We're also very excited about being able to extend and show off areas of the bunker that have never been seen before. Recently a whole host of television programmes marked 30 years from when we were, literally, on the brink of a nuclear war. Since the bunker only opened to the public 20 years ago, people are amazed at just how recent and real the threat was, and just how prepared we were."

For more information on Scotland's Secret Bunker see www.secretbunker.co.uk.

James Mitchell also owns the former R4 ROTOR Sector Operations Centre and RGHQ at Barnton Quarry to the west of Edinburgh. This is currently also being restored with the intention of opening to the public in the future.

SOURCE: Allmediascotland.com, February 2014

Altamira Caves reopened to the public, Spain

France and Spain have dramatically painted cave walls dated to around 14,000 to 20,000 years old, whereas in England we have only prehistoric art executed (as at Cresswell Crags in Derbyshire) by scratching curved and straight lines on the walls to depict animals and so forth. Why our own islanders didn't use red ochre and charcoal as their French and Spanish cousins did is a puzzle.

At the Altamira Caves in northern Spain (as at Lascaux in France), replica decorated 'caves' have been created for visiting tourists, as 'the people who visit the caves have the bad habit of moving, breathing, and perspiring' resulting in deterioration of the paintings. However, it has now been reported that at Altamira a maximum of five tourists a week (chosen randomly on randomly selected days) will be admitted to see the real thing for a test period. Visitors at the site can be as many as 3,000 per day!

Humidity, temperature and carbon dioxide levels in the caves will be monitored, as will the condition of the artwork (especially mould growth).

SOURCE: KASSAM, Ashifa, 2014, Spain allows tours of cave paintings again. *The Guardian,* 27 February 2014

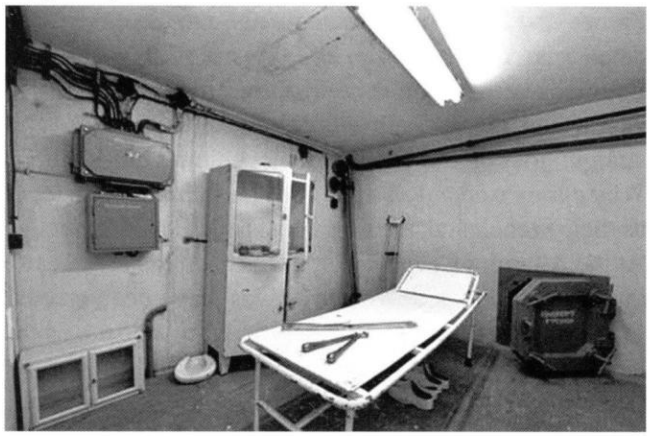
Communist spy bunker under Prague hotel no longer secret

If you were a VIP who stayed at Prague's Jalta Hotel between 1958 and 1989, your room was bugged and your phone was tapped. Behind its attractive 1950s façade, the hotel has been hiding a secret – there was a 24-hour underground spying operation that listened in on guests. From a bunker twenty metres below Wenceslas Square, communist officials monitored the hotel's foreign guests with a large bank of listening equipment that only a select few ever knew existed. None of the hotel staff were allowed to go into or even talk about the basement. And while communism ended in 1989, the bunker remained in the possession of the Ministry of Defence until 1998, when they finally declassified its existence and turned it over, as is, to the hotel.

The bunker, which was also designed to act as a place of safety for 120 top officials and 30 support staff including doctors in the event of a war, has now been turned into a museum of communist-era history that the public can visit on guided tours.

The bunker, protected by thick concrete walls, had its own power and water supply to sustain those who would have been based there. Three rooms of the bunker have been refurnished and equipped as though they were the centre of a communist-era spying and surveillance operation. Included among the exhibits, which have been collected together by a group of enthusiasts, is the switchboard that enabled the state security agents to listen in on guests.

A board behind the listening post shows that rooms were ranked according to how closely they were scrutinized. Those coded red were apparently listened to most closely, with activity in yellow and green rooms monitored less frequently.



As the bunker was also designed to act as a place of safety for 120 top officials, it had a medical centre

Many rooms in the bunker still have original equipment from when the facility was equipped as a listening station and hospital, including old telephones, gas masks, beds, first-aid kits and a doctor's examination table.

The hotel, and its bunker, was built between 1954 and 1958 on an area of land that was available for development as a result of a bombing in 1945. The style is sometimes called Stalin Baroque, and the architect was Antonín Tenzer. It is not clear if he was involved in the design of the bunker.

To reach the bunker, visitors have to take a lift to the hotel basement before descending further on concrete steps. They pass through a room equipped with a shower that could have served to decontaminate visitors, before entering the bunker itself.

On a level beneath the listening post and mini-hospital there is a large water tank that could have sustained residents of the bunker for as long as two months. Tunnels leading out to Wenceslas Square were built, although most have long been blocked off as a result of the construction of the metro, while there is also a tunnel that links to a second bunker.

Tours of the bunker last 30 minutes, are limited to a maximum of seven people. Places must be booked in advance. The museum is open Mon and Wed or Tue and Thu (alternating weeks) 5–8 pm. To book tours e-mail: concierge@hoteljalta.com

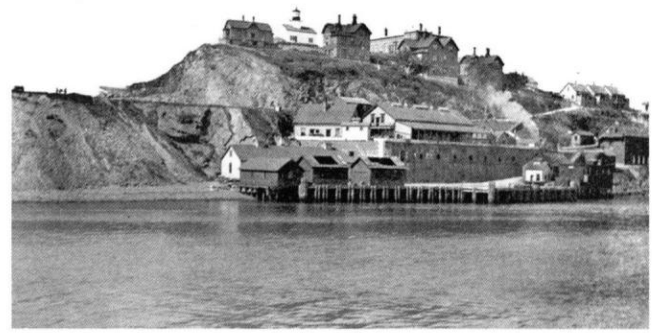
SOURCE: *Prague Post,* 30 November 2013

NEWS – MILITARY AND DEFENCE

Underground fortress found beneath Alcatraz, California

Researchers from Texas A&M University using ground-penetrating radar technology have discovered a network of tunnels beneath Alcatraz prison in San Francisco Bay. The former history of the island is well documented. Following the acquisition of California by the United States and the onset of the California Gold Rush the following year, the U.S. Army began studying the suitability of Alcatraz Island for the positioning of coastal batteries to protect the approaches to San Francisco Bay. In 1853 the United States Army Corps of Engineers began fortifying the island.

The island was encircled with steep walls built of stone and bricks abutting the rock faces, and buildings for accommodating defence personnel and a temporary launching jetty were also added. The three-storey citadel took final shape by 1859 when gun positions, guard houses and a drawbridge over the moat (encircling the citadel) were all added. The citadel had housing capacity for 200 soldiers with food storage facility to last for four months in case of any long-drawn attack.



Alcatraz Island in 1895

The tunnels would have been an important part of the fortifications and would have been used for the movement of personnel and the storage of ammunition in underground magazines.

SOURCE: *BBC News,* 27 February 2014 and Wikipedia

Recording World War I air-raid shelters and armaments stores

The development of subterranean air-raid shelters dates from World War I, in response to Zeppelin raids from Germany. Mostly in Kent and up the east coast of England, these were generally reused pre-existing tunnels, such as those in and around Dover. Whereas more or less bomb-proof magazines had long been a feature of forts, the sheer scale of the First World War, and the new threat from enemy aircraft, stimulated the development of large subterranean explosives and bomb stores, notably Woolwich Arsenal's store at Chislehurst 'Caves' and, perhaps, at the Reigate 'Caves'.

The Council for British Archaeology has advertised a recording scheme for remaining physical evidence for the conflict of 1914–18 and it is up to Subterranea Britannica members to ensure that the underground dimension is not (as so often) overlooked. Relevant websites for how to get involved are www.homefrontlegacy.org.uk and www.archaeologyUK.org/first-world-war

English Heritage is also, for obvious reasons during 2014, making World War I structures a priority, although a presentation attended recently by a senior designation officer rather overlooked the underground dimension. He assured your scribe that this area was not being ignored or forgotten.

SOURCE: COUNCIL FOR BRITISH ARCHAEOLOGY, 2014, Recording the remains of the First World War. *Council for British Archaeology Newsletter,* 27

Filmmaker believes he has found Hitler's secret atomic research bunker

An Austrian filmmaker has started searching an old underground Nazi facility for a labyrinth of top-secret tunnels he believes was the site of Hitler's research into the atomic bomb. Andreas Sulzer is now drilling into the remains of a wartime production and research centre buried deep in the Austrian hills surrounding the town of St Georgen an der Gusen a few miles east of Linz.

Thousands of prisoners from the nearby Mauthausen concentration camp excavated the tunnels of the Nazi site, which produced parts for the Me262 fighter – the world's first operational jet-powered combat aircraft. But the filmmaker says he has evidence that there could be up to twelve miles of unknown tunnels that once housed a secret research centre where scientists strived to develop the atomic bomb. After the war the tunnels were abandoned, and ten years ago local authorities got the 'known' 45,000-square-metre complex filled in with concrete owing to the danger of collapse.

Mr Sulzer said he was put on the trail to St Georgen when researching the history of Viktor Schauberger, a German wartime scientist. He discovered that from 1941 he was involved, under the strictest secrecy, in research projects for the SS in St Georgen. In his letters he talks about splitting the atom.

SS Reichsfuehrer Heinrich Himmler at Mauthausen concentration camp in April 1941

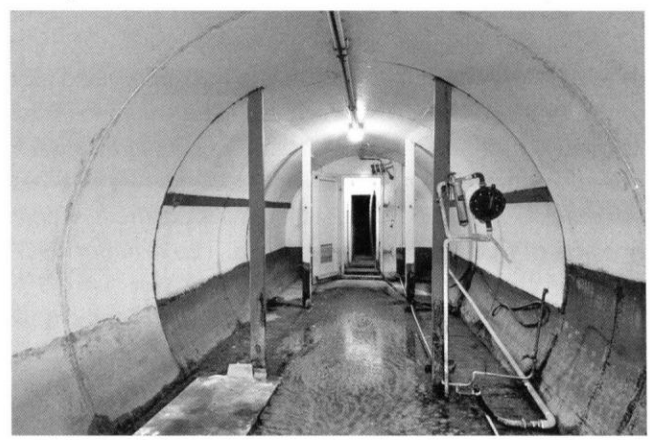
Sulzer also claims to have found US records and documents showing unknown tunnel systems at St Georgen, and that for some unexplained reason Mauthausen held a large number of physicists and chemists as prisoners. Heinrich Himmler, the head of the SS, was a regular visitor to Mauthausen-Gusen, which became one of the biggest and most secretive labour camp complexes, fuelling theories that atomic research was conducted there.

Suspicions about what went on in the tunnels have also been fuelled by reports of unusually high levels of radiation in the area, prompting speculation that Nazi scientists had carried out experiments involving uranium. Although geologists have said the radiation may be nothing more than the natural levels, the local authorities want the mystery cleared up.

SOURCE: *Daily Telegraph,* 10 February 2014

£2.5m Worcestershire mansion with two nuclear bunkers is offered for sale

A five-bedroom detached property in Drayton, Worcestershire, has been put on the market. The house which stands on 9.5 acres of land has five en-suite bedrooms, garage space, drawing room, dining kitchen, cinema and gym. It was bought by Graham Wainwright four years ago and he is selling after refurbishing it into family home.



One of the two fallout shelters

Two nuclear fallout shelters were put in by the previous owner in the 1980s because he was paranoid about bombing by the Soviet Union. The shelters are 10ft underground with one placed 12ft from the house and the other one 100ft away.

SOURCE: *Daily Mail,* 21 January 2014

Death of Emlyn Jones and the destruction of the V3 super-gun at Mimoyecques, France

Emlyn Jones [1915–2014] completed the destruction of the monstrous concrete V3 super-gun bunker between Calais and Boulogne on 9 and 14 May 1945. Many members of Subterranea Britannica will have visited this intriguing site which, unlike the now glitzy V2 base at Wizernes (La Coupole) near St Omer is (or was when your scribe last visited) very agreeably managed as a 'one man and a dog' operation. You bought a ticket at a caravan parked outside the tunnels and enjoyed a self-guided tour underground.

Although the site was heavily bombed before the end of the war, and dynamited afterwards (by Jones), access has been re-established and you are free to roam. Off-limits areas were, and perhaps still are, indicated by skimpy bits of chicken-wire. It is left to you, the visitor, to do your

own risk assessment! What is accessible is all on one level and consists of the remains of two parallel rail access tunnels, cross-passages between them, and crumbling vertical shafts to lower levels, and equally crumbling slope shafts to the surface. There are reportedly several levels lower down, not accessible, and entombed slave workers (although at least one published account says there is no firm evidence for that).

There is also, at one point, an actual or perhaps simulated section of a Nazi V3 pump gun. The idea was that salvos of long thin 200 lb missiles, 25 at a time, would be propelled up the sloping launch barrels, accelerated at intervals by additional explosive charges. The pump-gun barrels were said to be 330 feet long, and inclined at an angle of 50°. The whole thing was designed to fire 600 missiles per hour, all aimed at central London, and could not fire them anywhere else. It couldn't be steered and, it seems, it didn't work, although those responsible for creating it couldn't face the prospect of confessing this to Adolf Hitler!

After the underground exploration, visitors should have a look at the business end of this super-gun, on the top of the hill above. This diversion isn't an advertised part of the visit and there is no clear path, but the man in the caravan will direct you to a scrambling route through a hedge and alongside some agricultural land by which you can reach a wasteland of smashed mass concrete, where five sets of five gun barrels emerged. The result of RAF attention and 'tallboy' bombing is impressive.

Initially the British military authorities assumed this installation was (like La Coupole aka Wizernes) a static V2 site, hence the bombing. After the German surrender Winston Churchill ordered that the destruction already wreaked by the RAF should be completed underground 'while our forces are still in France'. Jones and others from the Royal Engineers exploded 35 tons of explosives underground, an act regarded by Charles de Gaulle as 'an attack on French sovereignty'. The obituary notes that Churchill commented, with a chuckle, that 'Somehow, a message from De Gaulle managed to reach us just a bit too late'.

SOURCE: ANON, 2014, Emlyn Jones. Bomb disposal officer who blew up a Nazi 'super gun'. *Daily Telegraph,* 24 February 2014 / Paul Sowan

WWII bunker uncovered at school in North Yorkshire

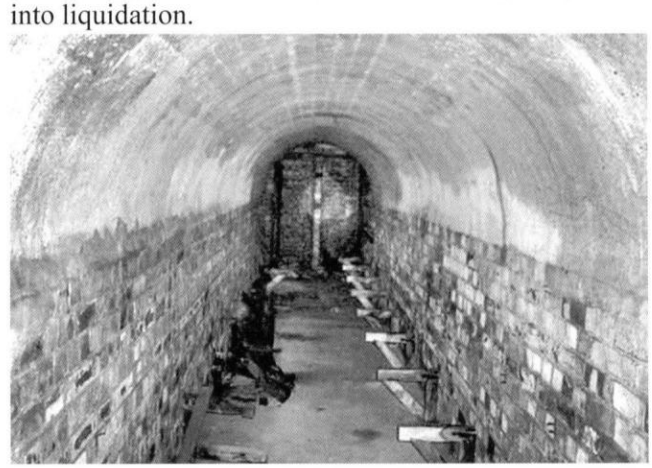
Work to build an extra classroom at Hensall primary school near Goole in January 2014 stopped almost before it started after North Yorkshire County Council contractors discovered an extensive Second World War underground air-raid shelter as they were clearing the site.

The U-shaped bunker, which is made up of three long tunnels each with toilets at either end and which still contains some of its original furniture, is thought to have been built for the protection of Hensall's schoolchildren. The village was sited near a wartime airfield and was in the flight path of German bombers.

As the primary school developed postwar, the bunker entrance, located under an extremely overgrown fenced-off garden at the back of the old schoolmaster's house, looked like the remains of a garden wall. Although there was some local knowledge of a former school air-raid shelter, its existence and the extensiveness of its structure underground had been largely overlooked and forgotten – until now.

Certainly the shelter did not show up on any local or heritage searches even though planning permission for additional classroom space had been long and complicated.

Hensall's School Master's House and Old School, built in 1854 by architect William Butterfield, is a Grade II listed building. The main school, built as a later addition, has also experienced problems of subsidence because of underground mine workings which had caused collapsing drains. As well as creating additional teaching areas, therefore, the county council had sought to build a new drain around the school to resolve subsidence issues and had been involved in protracted negotiations to rectify the drainage with UK Coal which subsequently went into liquidation.



Wooden supports for the bench seats are still in place

Hensall, which is full to capacity with over 130 children, expects its numbers to grow to around 145 pupils so additional space is pressing. However, if the shelter is also deemed a listed building along with the school, the county council faces the prospect of having to seek listed building consent yet again from the Secretary of State for any changes that would have to be made to the bunker entrance to build the new teaching area.

County Councillor Arthur Barker said: "While the bunker is an exciting find and is of obvious historic interest, it leaves the county council with a tricky problem to solve. The delays we have already experienced because of issues associated with a listed building and mining subsidence have now been compounded by the shelter's discovery and it is not at all clear how we can move forward."

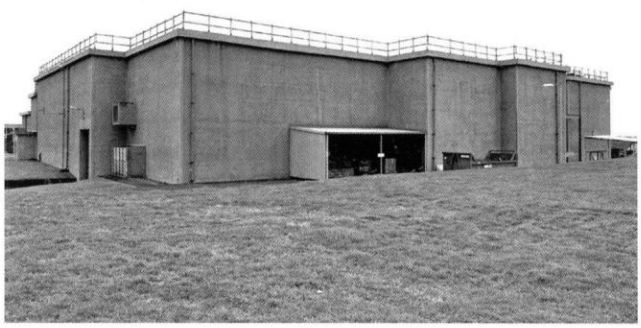
SOURCE: North Yorkshire County Council press release, 3 February 2014

Another one bites the dust

The Type-85 radar technical block at RAF Boulmer, Northumberland, has been demolished. The Type-85

radar was able to cut through Russian jamming with a range in excess of 200 miles; it was also equipped with banks of transmitters and receivers which could rapidly change transmitting frequencies to deter hostile blocking attempts. In order to achieve this performance it required a set of five powerful diesel generators which would have been capable of supplying sufficient power for a large town.

The radar was housed in a massive 3-storey R12 concrete technical block with a second block alongside housing the generators. Flight trials started in August 1967, but the radar did not come fully on line until 1968. The R12 was one of three around the country, the others being at Neatishead and Staxton Wold.



The R12 technical block at RAF Boulmer in 2005.
Photo Nick Catford

The R12 at Staxton Wold was demolished in 2010 which leaves Neatishead as the only surviving example of this important Cold War building.

SOURCE: *RAF News,* February 2014 and Sub Brit website:

www.subbrit.org.uk/rsg/sites/b/boulmer/index.html

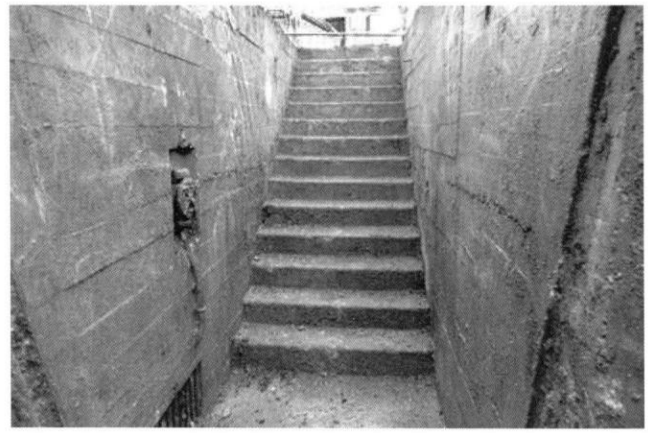
Air-raid shelter found beneath Dartford Grammar School playground

History lessons will never quite be the same again at one Kent school after a Second World War air-raid shelter was uncovered in the playground. Workers at Dartford Grammar School discovered the site and teachers plan to use it to celebrate the local area's history, giving its students first-hand insight into wartime life.

A main entrance and three exits were uncovered at the shelter and it is now hoped that the school will receive National Heritage Lottery funding to continue their excavation later this year. The school would like to turn the shelter into a resource for the students but also to make it bookable by local schools and history groups in the surrounding area.

The junior playground was resurfaced in 1952 when the shelters were covered up and were not found or entered again until February 2014. The entrances excavated so far will be covered up with metal sheeting until building work on the school's science building is completed.

Despite being stuck under concrete for decades, the shelter is part of Dartford Grammar's rich wartime



history. During the war, pupils seemed to spend more time in the shelters than outside when flying bombs were raining down on the Southeast. The town was directly under the enemy flight path to London which put the grammar school at considerable risk. After the war, the task of rebuilding and repairing began. The junior playground, where the shelters were found, was half-full of allotments from the Grow More Food campaign. There was a large water tank and gaping holes to the entrances of the trench shelter.

The water tank was soon taken down and one of the shelter entrances was covered with concrete. The other entrance was kept in use in case an emergency arose again.

SOURCE: *Dartford Messenger,* 8 February 2014

Type-80 Modulator building at Wick demolished

Planning permission has been granted for the demolition of the unfinished Type-80 modulator building at the Wick R8 GCI ROTOR radar station at Hill of Harland in Caithness. A new house will be erected on the plot.

Records show that the station at Wick was never completed and this is borne out by the evidence on the ground. The site had originally been used in WWII for a Royal Navy DF station. This was part of the RN intercept 'Y' service which, together with similar army, air force and civilian 'Y' stations, provided raw material for code-breaking at Bletchley Park.

The unfinished Type-80 modulator building.
Photo Nick Catford

The R8 operations block was alongside the road. In the mid-1990s this was largely intact although in a very dilapidated state and was gradually being broken up by the farmer for firewood. The site was later leased to a local car repair firm and two wings of the Seco- (wood fibre board) hutted building still survived when visited by Sub Brit members in 2004.

After the demolition of the R8 building at Chenies in Buckinghamshire this was the only surviving part of an R8 operations building. By 2011 the building had deteriorated further although the adjacent standby set house remained in good condition.

SOURCE: Highland Council planning application and Sub Brit web site:
www.subbrit.org.uk/rsg/sites/w/wick_rotor/index.html

Ipswich Council buys a nuclear bunker but can't find the way in

In February 2014 Ipswich council completed the purchase of the former Crown Court building which comes complete with a nuclear bunker underneath. Officials would love to have a look around the bunker but, at first, they had no idea how to get into it! There is no door from the Crown Court building and they eventually found that the only way in is through the police station next door.

The police won't let anyone in for 'security reasons', but they have confirmed they have access and a former police officer described what is there. Since the end of the Cold War the bunker has been used for storage. There are at least three long rooms and one was used for identity parades. There are also a number of side rooms which were used as dormitories. The main way into the bunker was always through the police station although there was a second access point that has now been concreted over. Council officials won't have to wait long before they can get into the bunker. The Police Station is due to close at the end of March when a new police station opens in the town centre. The building is due to be handed back to the borough council at the end of April.

Council leader David Ellesmere said: "People are fascinated by this kind of thing, even if it does look pretty unexciting when you get in it! We shall certainly be interested in having a look – and will probably offer members of the public the chance of taking a guided tour around the bunker." However that opportunity might not last long – the police station is expected to be demolished to clear the site for redevelopment in the long term.

SOURCE: *Ipswich Star,* 6 February 2014

NEWS – MINES AND MINING

Subsidence at Walter's Ash, near High Wycombe, Buckinghamshire

After a period of prolonged heavy rainfall in southern England, which may well have been the immediate cause, a 10-metre-deep crater around five or six metres in diameter appeared overnight a metre away from a modern house in Walter's Ash (SU 840980), Buckinghamshire, around the end of January or beginning of February 2014. A car which had been parked on the drive was now largely submerged in fluid mud at the bottom. A short report in the *Daily Telegraph* suggested this event may be related to 'eroding earth used to fill in the old clay, stone and chalk pits'.

Walters Ash is on a minor road northwards from High Wycombe via Hughenden to Princes Risborough, high up in the Chiltern Hills, about 200 metres above sea level. The Upper Chalk here is deeply buried under younger materials such as a residue of the Reading Beds and Clay-with-Flint at least partially derived from them. Before World War I, pits were worked in these younger beds for sarsen stones, boulders of silica-cemented sandstone from three to 30 feet across, used as building-stone and for kerb stones and road paving. When members of the Geologists' Association visited on 26 July 1919 the digging of sarsens had recently recommenced, the pits having been out of action during the war. The Director of the excursion noted in his report that nowhere had the pits reached the underlying chalk. Neither mining nor brick-making are mentioned in the report. The possibility of solution features in the chalk at depth was discussed. Much the same information can be found in the Geological Survey's *Memoir* for the district, published in 1922.

However, the sinking out of sight of so many cubic metres of ground strongly suggests the material from the crater has run into a large cavity, such as a chalk mine. And indeed Honorary SB Member Harry Pearman in 1985 recorded a chalk mine at 'Napple Common', Walters Ash, associated with a brickfield and kiln. This in turn suggests that other land in the immediate neighbourhood is also undermined and at risk. The Ordnance Survey indicates Naphill Common, a short way south of Walter's Ash, at SU 8497. Harry's research is summarised in volumes 14 and 15 of the Chelsea Speleological Society's *Records*, as follows.

> An Inspector of Mines report for 1897 identified a mine (for fireclay) owned by Thomas Free and Sons of Walters Ash. A published *Gazetteer of Buckinghamshire Brick Yards 1800–1980* notes a brick and tile works at what is sited as SP 836982, which presumably ought to be SU 836982, a location just to the west of Walter's Ash.

There are directory entries naming the operators of various brick-makers, lime-burners, stone-cutters, and coal brick and lime merchants from 1847 to 1891. The *Directory* also notes other sites cited as at SP (ie SU) 838984 and 837985 which seem to be more or less in the built up area of Walters Ash itself.

An article by G. Wilton-Jones in 1978 mentions Jack Free, 'the oldest surviving chalk miner', who helped locate and uncover a 60 ft. deep shaft which had been converted for use as a cess-pit. Other residents had used the mines as drains. 'There are many stories of collapses and subsidences in the area'.

In 1987 Harry subsequently published a report on and plan of a small chalk mine in the back garden of a house called 'Lone Pine' at SP (ie SU) 83615 98225, on the northern edge of Walter's Ash, which he and others had entered in 1984. A shaft over 20 metres deep was found to give access to about 40 metres or so of chalk mine gallery. There were indications of at least one further shaft, fallen in, nearby. 'Persistent stories of mines at Forge Lane and under a nearby RAF establishment' suggested to him that 'it seems likely that there could be many such shafts hereabouts'. Although the published plan is labelled 'Napple Common Kiln Mine' the location identified by the grid reference appears not to match Naphill Common as represented on the Ordnance Survey 1:50,000 map.

Arup Geotechnics' *Review of Mining Instability in Great Britain* (1991) noted over 40 chalk and flint mines in national grid squares SP 80, SP 90, SP 91, SU 89, SU 98, SU 99, TL 00 and TQ 09 in the Chiltern Hills of Buckinghamshire.

The scenario is strongly reminiscent of the Coley / Field Road subsidences in western Reading around 14 years ago, where houses had been built over a former brickfield / chalk mine location. There are numerous known small chalk mines in Berkshire, Buckinghamshire, Hertfordshire and especially Kent.

A *Daily Telegraph* article has recorded and illustrated a number of subsidences on the chalk outcrop of southeastern England during the winter now ending. In addition to the Walter's Ash subsidence, craters have appeared on the central reservation of the M2 in Kent, another vaguely stated to be in 'southeast London', and one at Croxley Green, Hertfordshire. The common feature is the chalk subsoil at all these locations.

It remains to be seen if all or any of these can be attributed to natural solution holes in the chalk, chalk mining, or just differential subsidence over small landfilled chalk pits. And, in the case of the first two of these, to what extent the channelling and concentration of rainwater run-off from concreted-over front gardens for car parking is to blame. Concentration of run-off water is known to weaken chalk mine pillars and ceilings. Buyers of properties in new housing developments in chalk districts might bear this in mind.

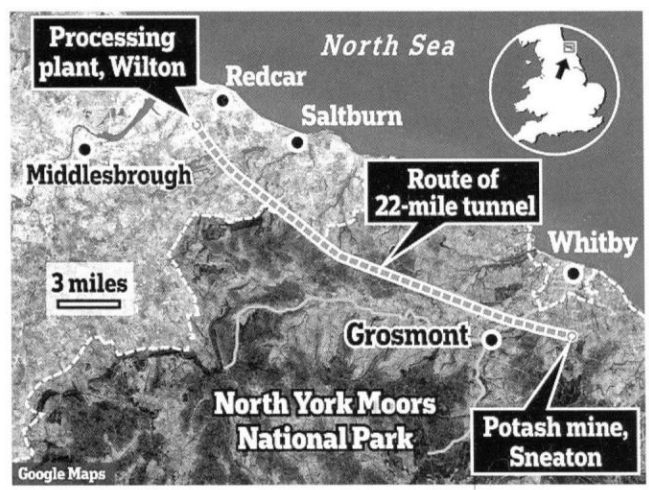
SOURCES: Numerous (details available on request)

37km tunnel planned to reduce impact of new Potash mine near Whitby

The York Potash Project is a proposal to develop a new state-of-the-art potash mine in the area between Whitby and Scarborough in North Yorkshire.

The Project would create over 1,000 direct jobs and thousands more in supply and support businesses. It would boost the local and the national economies and secure a supply of high-value potash for generations to come.

Plans to construct a pipeline from the Doves Nest Farm site to a processing plant at Teesside have been abandoned in favour of a six-metre tunnel which will run the 37km distance at a depth of 350m. The £167m tunnel which will transport polyhalite from a mine will be comparable in size to the Channel Tunnel.



The proposed tunnel addresses the concerns about the pipeline put forward during public consultation. The tunnel will reduce surface buildings and environmental impact by 70 percent and allow the mine a greater capacity.

The 6m wide tunnel will have a conveyor belt and a roadway running alongside it which will allow access to maintenance vehicles. There will be three access points. If the tunnel goes ahead, it would see over one million cubic metres of bedrock brought to the surface.

SOURCE: *Whitby Gazette,* 5 March 2014

Investigation of a newly discovered chalk well near Sittingbourne, Kent

Work at Vincent Farm, Oad Street, near Sittingbourne has revealed a hitherto unrecorded chalk well, a shaft-access chalk mine for agricultural purposes. The 13-metre deep shaft had been sealed by a brick dome 0.4 metre below ground level which was broken into by farm machinery in Autumn 2012.

Members of the Kent Underground Research Group were invited to investigate, and recorded the shaft as being two metres in diameter, widening to 4.5 metres. At a depth of six metres the miners had commenced four very small chambers aligned approximately north, south, east, and west, their lengths being from two to 2.8 metres. The chamber floors were about one metre higher

than the base of the shaft. On the evidence of the lack of a substantial debris cone, other than a 0.5 m high heap of soil resulting from the brick dome being breached in 2012, it is suggested that this mine has been undisturbed since the miners ceased work and sealed it. No artefacts are reported, but an early 19th-century date is suggested. The shaft top is to be stabilised to retain access, at least for potential hibernating bats.

SOURCE: LE GEAR, Rodney F., 2014, Chalk well subsidence at Oad Street, near Sittingbourne. *Archaeologia Cantiana* 134

Beam engine discovered buried at site of Forest of Dean colliery

Workers from the Coal Authority were called to the former coal mine at New Fancy after a slump in the ground was reported. Several days were spent excavating the site as the huge iron structure of a beam engine started to emerge. Coal Authority spokesman John Delaney said: "We'd always known it was there and now the plan is to keep it at the site as a reminder of what was there."

A beam engine is a type of steam engine where a pivoted overhead beam is used to apply the force from a vertical piston to a vertical connecting rod. This configuration, with the engine directly driving a pump, was first used by Thomas Newcomen around 1705 to remove water from mines in Cornwall. It was used for the same purpose at New Fancy.

Sinking of the pit started in 1852 and the mine opened in 1858. By 1860 it was producing 250 tons of coal every day and was one of the bigger mines in the area. The mine closed in 1944 and was filled in, burying the beam engine. The spoil heap at the former mine is now used as New Fancy View, a renowned bird-watching spot thanks to its high-up location and far reaching vistas.

SOURCE: *Gloucester Citizen,* 3 December 2013

Discovery of a new Blue John seam at Castleton, Derbyshire

Fluorite (calcium fluoride) is one of the commonest minerals, and an important industrial resource as the main source of fluorine and its compounds such as PTFE (polytetrafluoro ethylene). But the deep purple variety Blue John is found more or less exclusively in small quantities in seams in Carboniferous Limestone at Castleton, Derbyshire, where it has been mined from the eighteenth century onwards for making ornamental goods. Current annual production, at what is primarily a tourist attraction, is less than a tonne. It is very much a finite resource, and large fine carved pieces are rare and expensive.

In 1935 John Royse recorded that he had located a substantial quantity of Blue John in the mine, but concealed it for future exploitation. Unfortunately, he died without revealing the location, and it was thought he had secreted detached lumps of the mineral and buried them or walled them up somewhere obscure. What may well be Royse's hoard has now been discovered, and is in fact an unworked seam which had been hidden under mud and mine debris.

SOURCE: FORD, Trevor D., 2013, New resource of Blue John. *Geology Today,* 29 (6)

NEWS – MISCELLANEOUS

Buy yourself a final resting place in Wiltshire

Most of us nowadays ultimately go up in smoke. Historically, in England, burial was more common. Buying yourself a place on a shelf in a catacomb remains an option, but is expensive (including a lead coffin lining). Tim Daw of All Cannings, Wiltshire (a name to conjure with in archaeological circles), is now proposing a return to Neolithic practice, and has commenced construction of a modern long barrow, modelled on that at West Kennet. A 50-metre long concrete slab base has been laid for a burial mound calculated to hold 2,400 corpses. Apparently five persons have already signed up for places.

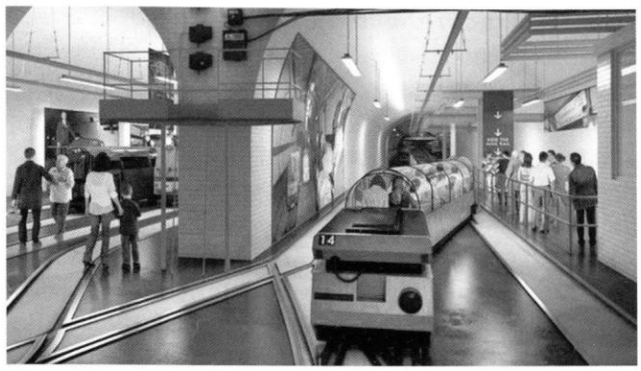
SOURCE: ANON, 2014, Now rest in peace the Neolithic way. *Metro*, 14 January 2014

Islington Council approves plans to open Mail Rail to the public

Plans to open the London Post Office Railway – known to many as Mail Rail – as a tourist ride have been approved by Islington Council. Visitors will be able to ride 0.6 miles of the tunnels under central London from 2020 and new postal museum will open at Mount Pleasant, in central London, in 2016.

The British Postal Museum & Archive (BPMA) still needs to raise £0.5m and plans to launch a public appeal later this year. The team also expects a decision to be made in May on its application for £4.5m funding from the Heritage Lottery Fund.

Mail Rail was approved by an Act of Parliament a century ago, and during its heyday its driverless trains carried 12 million postal items daily on the line stretching from Whitechapel in the east to west London's Paddington. In its prime, 220 people worked on the line, which runs beneath Oxford Street in central London – at one point within a few feet of the Bakerloo Line. But by the 1990s, Royal Mail built a new hub in Willesden, west London, and by 2003, only three of eight Mail Rail stations still worked. That year, Royal Mail said the line cost five times as much as using roads and the network was mothballed. BPMA director Adrian Steel said: "It is a fantastic



Artist's impression of Mailrail after opening to the public

opportunity that Islington borough council has given us – the green light to open up these unique tunnels to the public and reveal the captivating story of Mail Rail."
SOURCE: *BBC News*, 11 March 2014

Unusual man-made pseudokarst caves in Folkestone Sand near Redhill, Surrey

Most natural caves are formed in limestone in which fissures have been widened by the rock being dissolved by rainwater made mildly acidic by atmospheric carbon dioxide. Solution caves also occur in beds of gypsum (hydrated calcium sulphate), although those around Ripon appear not to be accessible: your scribe has visited some near Chortkiv in Ukraine in the company of the local caving club. Less common are caves eroded (not dissolved) in sandstone by running water. A third class is represented by lava tubes in volcanic districts such as found in Iceland.

A sighting of impermanent water-eroded caves in sandstone has been reported in disused sand pits in the Redhill / Reigate area of east Surrey. Although these caves are formed naturally by running water washing sand out, they are initiated by human intervention and at this inland location would not form in the absence of such intervention. Caves of this kind are formed where pits have been dug for the extraction of sand. On occasions, the pit has been extended below a perched water table, the water being held up and channelled by a relatively hard and impervious layer such as carstone, an iron-oxide-cemented sandstone.

Breaching this layer, now exposed in the steep-sided sand-pit working face, allows the water to form a spring some way up the artificial cliff, which then forms a waterfall cascading to the pit floor. The cliff-face spring then erodes back into the rock, forming at times surprisingly spacious but very impermanent caves. Paul Sowan and other members of the former Unit 2 Cave Research & Exploration club entered and reported on another such cave in a sand pit between Merstham and Redhill in 1989, and witnessed another one nearby falling in! And an earlier report of this class of cave was reported at Reigate by Dines and Edmunds in 1933.

SOURCES: WINDER, Paul, 2014, Patteson Court landfill. *Bull. Holmesdale Natural History Club,* 107, page 7; DINES, H.G., and F.H. EDMUNDS. 1933, The

View into a man-induced natural cave in Folkestone Sand, the uppermost of the four beds in the Lower Greensand in east Surrey. The cave has formed by water erosion about half way up a south-facing working face in an actively worked sand pit east of the railway lines north of Redhill. Groundwater has been directed southwards by an impermeable layer of 'carstone' (an iron oxide cemented sandstone) which forms the floor of the cave. The small stream seen here formed a waterfall to the floor of the sand pit. Thinner irregular seams of carstone can be seen in the cave walls and ceiling, and broken pieces lie on the floor

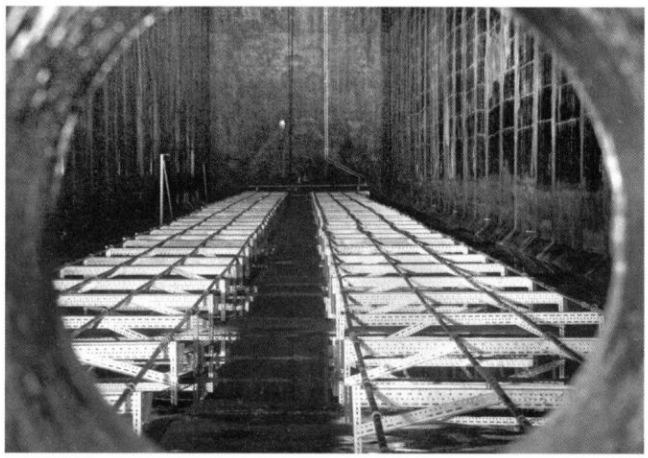
geology of the country around Reigate and Dorking. MGS: xiv + 204pp; SOWAN, Paul W., 1990, Rapid active pseudokarst near Redhill in east Surrey. *Bull. Croydon Natural History and Scientific Society* 89, page 2

World's longest echo recorded in underground fuel tank

An oil tank in the Scottish Highlands has earned a place in the record books after producing the world's longest echo. Lasting an incredible 75 seconds, the reverberation smashed the previous record – also set in Scotland more than forty years ago – by more than a minute.

It was recorded by an acoustics expert in a tank measuring twice the length of a football pitch, which was 30ft wide and more than 44ft high. The discovery was made by Professor Trevor Cox when he climbed into the tank at the underground Inchindown fuel depot, near Invergordon, and started singing and shouting. "I was like a toddler sitting at a piano for the first time, thrashing the ivories to see what sounds would come out," he said. "Reluctantly, after a few minutes I stopped playing with the acoustics and started preparing for my measurements."

RCAHMS archaeological investigator Allan Kilpatrick, working with Professor Cox, shot a pistol with blanks about a third of the way down the 80-year-old tank. Standing a third of the way from the other end, Professor Cox, of Salford University, recorded the sounds with microphones.



Inside one of the fuel tanks. Photo Allan Kilpatrick

SOURCE: *Daily Mail,* 17 January 2014

See also *Subterranea* 24, September 2010 'There was oil in them there hills' by Allan Kilpatrick, pp.22-30

Lundy Island, Devonshire

Lundy (it means *Puffin Island*) is a National Trust property (since 1969) eleven miles northwest of Hartland Point on the Devonshire coast. It is about a mile and a half long, and half a mile wide. An undated 'Official Guide' mentions, *inter alia*, old copper mines, Queen Mab's Grotto, several quarries, Benson's Cave, and the Devil's lime kiln.

According to a recently published survey it is almost entirely granite. Unexpectedly, however, the granite is not related geologically to the Devon and Cornwall granites of Palaeozoic age, but like the volcanic rocks of the Inner Hebrides is of much more recent (Tertiary era) formation. Most of the 'caves' are entirely natural rift caves or wave-eroded sea caves, and thus outside the scope of Subterranea Britannica's interests. A few, however, have either been used or even possibly made by human beings.

Listed anti-clockwise from the landing jetty at the southeast extremity of the island, Watson's survey includes data for the following man-made or man-used 'caves':

The Old Man's (or Sentinal's) Cave, 38 metres long, and recorded as having been used for storage after a shipwreck in 1867.

A 'Landing Quay Cave' 9.5 metres long and described as 'possibly man-made' that has also been used for storage.

North of Gull Rock (just over halfway up the east coast) an adit referred to as Tibbett's Point Mine, accessed from a cliff ledge, and stated to have a length of 61 feet (18.76 metres). A survey made by members of the Shepton Mallet Caving Club in 1969 accompanies this short entry. It seems likely that this 'mine' in an awkward location cost more to drive than the value of any ore that might have been extracted!

Queen Mab's Grotto, a sea cave near the Frenchman's Landing a little further north, is 7.5 metres long, and said to have been used as an ammunition store for the Brazen Ward Battery.

Two 'underground rooms' reportedly exist at low level in the cliffs near North End Point, but were not located by Watson.

Old copper mines are reported at Long Ruse (or Long Roost) near the northwestern extremity of Lundy. These comprise three parallel adits just above the high water mark, with lengths of 3.6 metres, 12 metres, and 15 metres. Watson notes that 'the copper samples were poor and the mines abandoned'.

The 'Devil's Limekiln' (near the southwest corner of the island) appears to be a natural rather than an industrial feature. As there is no limestone on the island, any lime-burning would have relied on stone and fuel imported from the mainland, and located at a much more accessible place than the cliff face!

Benjamin's Chair Mines, halfway along the southern coast, comprises two adits, 10 metres and 23 metres long. Remains of timber supports are noted. About 12 metres higher up the cliff is another adit, a metre wide and two metres high, driven in for about six metres. This trial mine was probably as unproductive as the other two.

Benson's Cave, near the southeast of Lundy, is just below the 'castle' and 300 feet above sea level. Watson reports this to have been excavated in 'friable shale' in or about 1700, perhaps by smugglers. The 20-metre-long tunnel is uniformly 2.5 metres wide, and 3.5 metres high, and has a built stone lintel over its portal. Nearby a small brick hut has been built into the hillside. The smuggling interpretation is perhaps far-fetched. Importation of smuggled luxury goods from France onto the British mainland seems to make economic sense. But what might be smuggled in from the next nearest coast, of South Wales, and what duty-free sales might have been made to the tiny population of Lundy (population 94 in 1901) amongst which one supposes few secrets would exist!

SOURCES: Numerous (details available on request)

Another cannabis factory found in a bunker

Two men have been arrested in connection with a cannabis factory discovered in a bunker in Rendlesham in Suffolk. Police searched the building at the end of February 2014 and found the 40-feet by 80-feet bunker was full of cannabis plants in various states of cultivation. More than 1,000 plants were discovered and seized along with electrical equipment. The men, aged 38 years and 37 years, both of no fixed abode, were arrested on suspicion of production and cultivation of cannabis and are being held at Martlesham Police Investigation Centre for questioning.

The location of the bunker has not been identified but it is likely to have been part of the former RAF Bentwaters.

SOURCE: *East Anglian Daily Times,* 27 February 2014

New tunnel shopping centre proposed for Bradford, Yorkshire

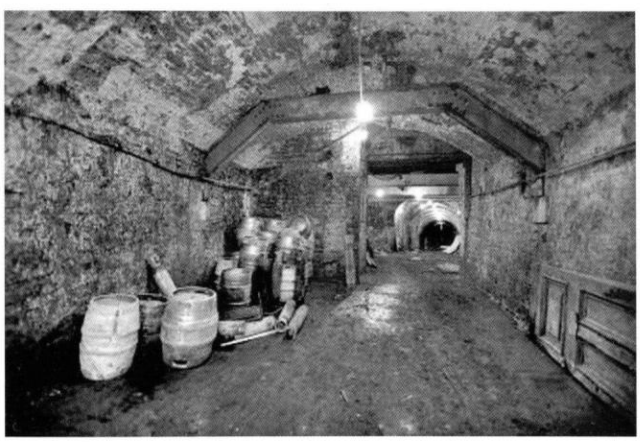
Plans to convert a little-known warren of tunnels beneath Bradford city centre into a base for young entrepreneurs have been welcomed by business leaders and politicians.

Graham Hall, of developer Sunbridge Wells, has worked with architects to come up with a plan for around 12,000 sq ft of space on three different levels beneath the Sunbridge Road area, near to City Park.

The £1m project is being privately funded but the developers are working closely with Bradford Council and a planning application will be submitted in April and subject to planning permission, it could be open by the end of this year.

A courtyard will have an open plan glass and steel staircase leading to Upper Miller Gate. This would be designed to bring light to the tunnel system, covered by a Victorian-style atrium entrance and exit to the shopping area below.

Teams are still digging out the partially backfilled tunnels and about 200 tonnes of earth, rubble and timber have already been removed. The full extent of the complex is not yet known. The tunnels have had various uses over many decades, including as nightclubs and bars.



Beer barrels betray the tunnels' previous use as a nightclub

The developers are hoping the underground complex will become Bradford's own Victorian quarter incorporating Victorian and contemporary shop units together with trading street barrows, restaurants and bars, all in a setting in keeping with the history and ambiance of Bradford.

SOURCE: *Telegraph & Argus,* 18 March 2014 and *Yorkshire Post,* 19 March 2014

Industrial history of Croydon, Surrey

Former SB Chairman Paul Sowan has been collecting material for a booklet on the industrial history of Croydon for a quarter of a century or more. There is now some prospect of this being published (by the Surrey Industrial History Group) within the next year. Naturally, man-made underground sites will be included, from suspected dene holes (medieval agricultural chalk mines) to railway tunnels and river culverts to subterranean air-raid shelters. A number of non-industrial excavations in the Thanet Sand and a medieval undercroft may be added for good measure.

Industrial Archaeology in Kent

An Industrial Archaeology Group has been set up for Kent by members of the Kent Archaeological Society. Paul Sowan has attended several planning meetings at the Society's headquarters at the museum at Maidstone. At least half of the Committee happen to be members of the Kent Underground Research Group (a specialist group within KAS). KURG members have a superb track record of investigating, surveying, recording, researching and publishing mines and tunnels in the county, and are eminently qualified to extend the work to industrial relics in general.

Recycling Northern Line waste heat for heating in Islington, north London

Some 500 homes in Islington are to be at least partially heated with warm air extracted from London Underground's Northern line tunnels with, additionally, some from a UK Power Network's electrical sub-station.

SOURCE: TRANSPORT FOR LONDON, Hot air from Tube will heat London homes. *Daily Telegraph,* 21 November 2013

Rock-cut cellar for sale, Wolverhampton, West Midlands

In September 2012 a Grade II Listed property, Rock Cottage in Wolverhampton, was offered for sale, including a rock-cut cellar. The sandstone 'cave' is around six metres (20 feet) long and appears, from the published photograph, to have a ceiling high enough for standing in comfort.

SOURCE: WATSON, Tina [Owner], 2012, Holy hideout! Home comes with Bat cave. *London Metro,* 27 September 2012

How should you ensure the permanent preservation of your photographs?

Many Sub Brit members take numerous photographs of places very rarely visited by anybody else, and in many cases places that are subsequently impossible to revisit on account of demolition, collapse or back-filling. One hopes they all keep careful notes of dates and exact locations. Those of us who have during the last fifty years taken hundreds or thousands of photographs on old-fashioned chemical film are urged to have all our prints and slides scanned and preserved electronically. But they aren't much good if they cannot be retrieved, complete with accompanying data.

Some members may have entrusted their images to various concerns offering long-term secure storage and retrieval, but Terry Waterfield urges 'keep your photographs on hard discs and CDs – do not give them to some clever clogs to store them for you'. He has investigated a number of concerns that have undertaken such storage, and presents some notes on ten of them. For example, he states that www.disusedrailtunnels@fotopic.net has closed and that, as of April 2013, 100,000 images have been irretrievably lost. Another storage site is now 'in Japanese' and no longer relates to the original subject specialism. URLs have changed or disappeared. Some have been reconfigured or restructured. You have been warned!

SOURCE: WATERFIELD, Terry, 2013, You thought it was where? *Industrial Archaeology News* 166, page 9.

NEWS – PUBLICATIONS

Archaeology in depth in Nottingham

DETAILS: LOMAX, Scott, 2013, *Nottingham: the buried past of a historic city revealed.* Pen & Sword Books Ltd: 192pp ISBN 978-1-78159-3899 £12.99

Much has been written and published about Nottingham and its numerous man-made rock-cut 'caves' in the last half century, but many authors have dealt predominantly with details of the underground features without relating them to the man-made landscapes in (or under) which the excavations lie. And the generality of mainstream archaeologists have restricted their investigations to conventional surface excavations, being reluctant to go underground, although in such a place as Nottingham there are so many rock-cut cellars and tunnels that they form a very significant part of a comprehensive history of the city.

Scott Lomax is a qualified and practising archaeologist who feels equally comfortable on and the surface and underground in the dark. This very welcome book provides an accessible overview of the development of the city from both the archaeological and the historical perspectives, and does not ignore the 'caves' and their setting in and relation to the urban landscape.

There is a thorough list of bibliographical references, especially to formal archaeological excavation reports produced in recent years, although there are some significant omissions when it comes to books and papers specifically relating to details of cave layouts and interior features.

Memories of British mines

DETAILS: ARNOT, Chris, 2013, *Britain's lost mines: the vanished kingdom of the men who carved out the nation's wealth.* Aurum Press Ltd: 192pp ISBN 978-1-78131-0700 £25

This is a well-produced and illustrated hardback volume of mining and social history, containing some accounts of 30 or so closed mines, and recollections of some of the miners who worked at them. Almost two thirds of the featured mines were for coal, with one to three entries each devoted to copper and tin, fluorspar, ironstone, lead, oil shale, rock salt and slate.

Britain's several extensive gypsum mines, a number of which are still in production, are not mentioned; nor are subterranean stone quarries (or stone mines). The geographical range is good, with England, north and south Wales, and southern Scotland all represented. There is a helpful frontispiece map of Great Britain indicating approximate mine locations, although curiously the numbers for sites shown on the map do not correspond with those listed on the contents page.

The numerous photographs, some in colour, depict men at work or at leisure, interiors and exteriors of mine buildings, underground scenes, machinery, and so forth. As the author remarks, not so long ago there were hundreds of working mines and thousands of working miners in Britain. With the closure (as the result of an underground fire) of Daw Mill colliery in Warwickshire in 2013 a chapter of British history is coming to an end. Relatively few men dig minerals underground anymore, many of them at a single deep mine, that for potash at Boulby near Saltburn on the Yorkshire coast. Several pages of engaging text are devoted to each mine, as well as the photographs.

The mines featured are: Geevor & King Edward, Wheal Mexico, and Wheal Jane & Mount Wellington (all in Cornwall); ironstone mines at Great Rock (Devon); New Dun (Forest of Dean, Gloucestershire) and Florence (Egremont, Cumbria); Carrs lead mine at Nenthead (Cumbria); Sallet Hole and Watersaw fluorspar mines in Derbyshire; Westwood oil-shale mine (Midlothian); Adelaide salt mine (Cheshire); and slate mines at Gwynfynedd and Oakley (Gwynedd).

Rock-cut subterranean space, Southwest France

DETAILS: TRIOLET, Laurent, 2005, *Troglodytes du Sud-Ouest: carrières, habitats, refuges, champignonnieres, graffiti, animaux.* Editions Alan Sutton: 96pp ISBN 2-84910-3527

This splendidly illustrated work features rock-cut subterranean space of various kinds in that part of southwestern France bounded by the rivers Charente and Garonne, including underground quarries for building limestone, 'cave' houses, sub-surface churches, mushroom farms, refuges and shelters, and so forth. The illustrations include numerous colour photographs, plans of sites, a reading list, and details of sites open to the public.

Men from the Ministry

DETAILS: THURLEY, Simon, 2013, *Men from the Ministry: how Britain saved its heritage.* English Heritage / Yale University Press: 294pp ISBN 978-0-300-195729

The is an important book about the origins, development, and work of what is now English Heritage, an organisation about to be split by the Government into two separate bodies. Although the first Scheduled Ancient Monuments Act, dating from 1882, provided for the scheduling of underground spaces made or used by human beings as Ancient Monuments, and although English Heritage has in recent years (and at last) Scheduled a variety of underground sites, the sub-surface elements of the heritage of England are barely mentioned.

The hermitage at Warkworth Castle, Northumberland, gets a passing mention. And there is a discussion of industrial monuments being officially recognised as worthy of protection, including accounts relating to the Grimes Graves flint mines in Norfolk, and Elemore Colliery in Durham. However, the index has no entries for such topics as air-raid shelters, bunkers, caves, the Cold War, mines, quarries, or tunnels.

Nor is the Monuments Protection Programme noted. The nation's modern defences and military structures, mining and quarrying industry, and transport infrastructure are

at least as important as Hadrian's Wall, and although English Heritage now accepts that point of view, this is elusive in the text. Simon Thurley is currently Head of English Heritage, having previously served as the top man at the Museum of London and at Historic Royal Palaces.

NEWS – TUNNELS AND TUNNELLING

Inquest on the deaths at Horn Hill road tunnel, Dorset

The inquest into the deaths at Horn Hill road tunnel, Dorset, of Michael Rolfe (72) and Rosemary Snell (62), has been reported. They died on 7 July 2012 when the car in which they were travelling was crushed and buried under a landslip into the northern approach cutting to the Horn Hill tunnel on the A3066 Bridport to Crewkerne road near Beaminster, Dorset. The car was not detected under tons of slipped mud and rubble when the scene was first inspected, and discovered only ten days later. The occupants are thought, from the crushed state of the car, to have died instantly. The road and tunnel were reopened to traffic on 29 July 2013.

The newspaper report is inaccurate on two counts. It is stated that the car was trapped 'under a wall of mud in a tunnel', implying a collapse of the tunnel itself, when in fact the tunnel remains intact. And the tunnel is described as 'the oldest road tunnel in the country' when that honour belongs to the road tunnel (now pedestrianised) in central Reigate, Surrey, completed in 1823–24. The Horn Hill tunnel was made in 1831–32, and a second road tunnel in Dorset, near Charmouth, dates from 1831.

SOURCE: PRESS ASSOCIATION, 2014, Couple crushed by mud 'died in a pure accident'. *The Guardian,* 26 February 2014 / Paul Sowan

Hammersmith tunnel gets green light from London mayor

Boris Johnson has given the green light to a scheme to replace the decaying Hammersmith flyover with a west London road tunnel. The Mayor announced that Transport for London was now behind plans drawn up by Hammersmith and Fulham Council to create a 'flyunder'. Officials at the transport body, which is spending £60 million fixing the 620-metre concrete structure to keep it in use for decades, have previously been sceptical about the proposal. But Mr Johnson, who previously said the project's viability depended on the development potential of the land released by the tunnel, said the finances now added up and he recently described the proposals as "the most fantastic scheme". "We're going to tunnelise the flyover;" he said, "the time scale will be three or four years, I expect."

The Mayor claimed there was now "sheer excitement" at TfL about the report commissioned by town hall bosses amid growing concern about the lifespan of the 53-year-old elevated A4 route, which is used by 90,000 vehicles a day. Three shortlisted options in the study – drawn up with Channel Tunnel engineers Halcrow – include a one-mile 'cut and cover' version costing £218 million to a two-and-a-half-mile route in a deep tunnel with a £1.7 billion price tag.

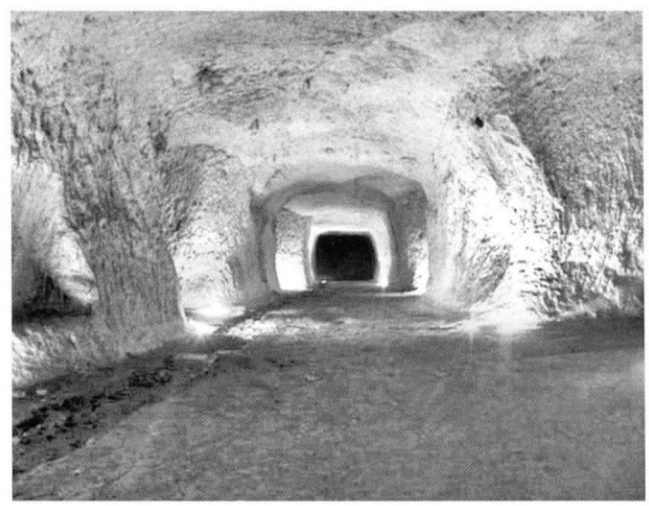
The report found that the removal of the flyover and the rest of the A4 through Hammersmith would release prime riverside land that could be worth up to £1 billion.

SOURCE: *London Evening Standard*, 3 March 2014

Ancient Roman tunnels are being mapped to stop Rome collapsing

While tourists might be preoccupied with snapping Roman landmarks in Italy's capital city, beneath the streets geologists are documenting equally ancient tunnels.

A labyrinth of subterranean passages that date back to the founding of Rome are being mapped to predict which modern buildings could be at risk of suddenly disappearing into a Roman quarry system. While this may seem unlikely, a staggering 83 structures have already collapsed due to the underground network of passages this year alone, ranging from buildings to streets.



One of the many underground quarries beneath Rome

A team of geologists from George Mason University, Washington and the Centre for Speleo-archaeological Research, Sotterranei di Roma, are exploring the underground network to produce a detailed map that can be used to assess areas of the city that are most at risk. The mapping activity is critical as over the years locals have been patching up holes that have suddenly appeared. The geoscientists are using 3D laser scanning to look for weaknesses in known tunnels, before entering them through manholes to map the network, once they know they are safe

SOURCE: *Daily Mail,* 4 December 2013

Unfortunate event at Victoria LU Station, London

Pouring ready-mixed concrete into a railway signalling control room seems unlikely to improve system performance. And so it proved at 13.40 on Thursday 23 January 2014 when through miscalculation or ignorance a quantity of the quick-setting material was used to fill a

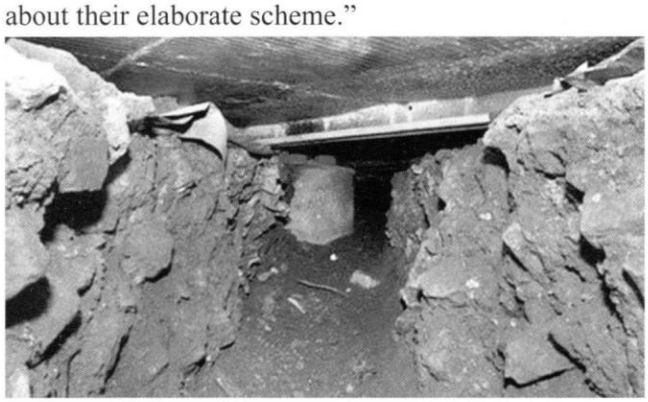
redundant subterranean void at London Underground's Victoria Station.

For whatever reason, concrete also flowed into the strategically vital space, and the trains stopped running (railway signalling relies on the system defaulting to STOP in the event of any problems). Services were suspended between Warren Street and the Brixton terminus. Passengers were initially told that 'flooding' was the cause of the difficulty, but it leaked out that the flood was a 20 cm pool of rapidly setting concrete! Well, as the Victoria line is more or less entirely subterranean (apart presumably from the depot), 'leaves on the line' or 'the wrong kind of snow' wouldn't have been credible.

SOURCE: TOPHAM, Gwyn, 2014, Tube finally has concrete excuse for train delays. *The Guardian,* 24 January 2014

Thieves dig tunnel to steal from Salford cash machine

Thieves who built a 50ft tunnel to a cash machine in Salford got away with more than £80,000 contained in cash boxes. The theft happened on 14 March at Tesco on Liverpool Road, Eccles, between midnight and 06:00 hrs. The raiders tunnelled under nearby wasteland overnight and into the shop, where they stole the cash. They then escaped back through the tunnel. Officers believe the thieves may have spent a number of months digging the tunnel because of the complex nature of its structure. Det Sgt Mark Toker, of Greater Manchester Police, said: "These people had obviously spent a long time plotting this crime and I doubt they would have been able to keep their plans secret for all that time, without telling others about their elaborate scheme."



Police said they did not yet know if the incident was connected to a similar raid at Blockbuster in Fallowfield Shopping Precinct in January 2012. Raiders escaped with £6,000 after the raid that echoed a storyline from the Channel 4 show *Shameless*. Police believe that same gang carried out a similar raid in 2007. There have been no arrests in either case

SOURCE: *BBC News – Manchester*, 20 March 2014

Progress with Crossrail tunnelling, London

Tunnel boring machine (TBM) *Phyllis* completed one of the two parallel Crossrail tunnels from the western portal west of Paddington to Farringdon in October 2013 and her sister *Ada* was due to arrive there in January this year. Over 65 percent of the main tunnelling is now completed. Most of the TBMs will have completed their part in creating Crossrail by the end of 2014.

At the new Whitechapel Crossrail station *Elizabeth* will soon tunnel through the wall of the already completed concrete station box, 32 metres below ground level, where 640 metres of station platform tunnels and 355 metres of subsurface station tunnels for passengers are being created. TBM *Sophie,* having tunnelled under the Thames, will soon cut through the London end of the Woolwich Crossrail station box. Meanwhile, back at Paddington, a new passenger subway tunnel is being dug to link Crossrail and Bakerloo line station platforms. With all the tunnelling on the western arm completed, work will now start on fitting out with track, signalling and stations and installing escalators. Dan Harvey has helpfully provided the names of all eight Crossrail tunnel-boring machines: *Ada, Elizabeth, Ellie, Jessica, Mary, Phyllis, Sophie and Mary.*

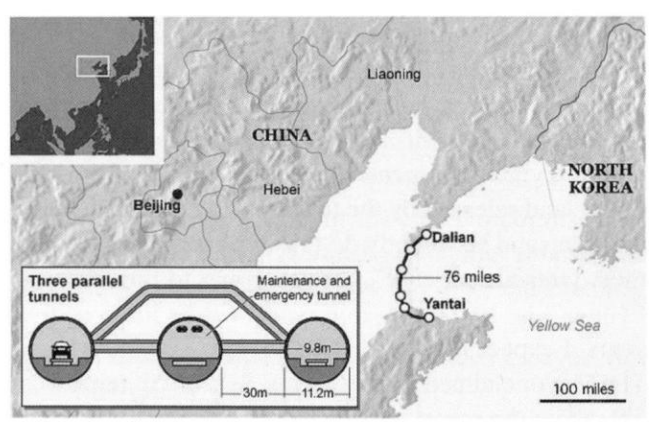
SOURCE: HARVEY, Dan, 2014, Tunnelling crescendo. *Modern Railways,* 71(785), page 98; and Fit-out stage fast approaching. *Modern Railways,* 71(786), page 98

76-mile road and rail tunnel to be built in China

At more than twice the length of the Channel Tunnel, China's latest mega-project is not short of ambition. A 76-mile-long tunnel will run between the northern city of Dalian and Yantai, on the east coast.

Work could begin as early as 2015 or 2016. The new tunnel will knock 800 miles off the current route between the two cities. It will also form a vital link in a high-speed rail line from China's frozen north to the tropical island of Hainan, in the south.

China has a history of epic engineering projects stretching back to the Great Wall. More recently it has built the world's largest high-speed railway network, longest bridges, and several of its tallest skyscrapers. Even so, the new £22 billion sea tunnel will present several challenges. Engineers will attempt to bore three tunnels – one for cars, one for trains and one for maintenance – through the hard rock, 100ft below the sea bed.



Vertical shafts will be dug on islands along the route to provide ventilation. But the area is prone to earthquakes

and the tunnel will traverse two major fault lines. In 1976, a 7.5 magnitude earthquake in the nearby city of Tangshan killed hundreds of thousands.

Experts warned that excavation work through an active fault needs special attention. The Chinese government is being cautious about the project. The tunnel was first proposed 20 years ago and many research teams have been looking at it ever since.

SOURCE: *Daily Telegraph,* 14 February 2014

Proposed tunnel for high-speed railway from Midlands to London

Lords Berkeley and Bradshaw have proposed a variant and subterranean route through north London for the southern end of HS2, the intended high-speed railway to link the capital to the Midlands and north. Instead of running the trains into an already congested terminus at Euston, they suggest the new line should run in a new twin-bore tunnel below both Euston and King's Cross / St Pancras stations, with new subsurface platforms at each. The new tunnels would run from Old Oak Common eastwards to connect with the existing HS1 line (Channel Tunnel Rail Link) between St Pancras and Stratford, allowing through-running between the Midlands, east Kent, and mainland Europe if required. Initially, through sleeper trains from the Midlands to France had been planned (and the carriages built: they are now in service in Canada!). Perhaps that plan may be resurrected sometime, making seriously early morning arrivals in France a reality.

SOURCE: ANON, 2013, 'Euston Cross' proposal aired for HS2. Railway lords' HS2 cross-London alternative. *Modern Railways* 70(775)

London Power Tunnels project will provide power for 120 years

National Grid hopes the £1 billion London Power Tunnels project will supply electricity to the capital "for generations to come". It will also power Crossrail through a generator in northwest London.

Teams of three miners are working 12-hour shifts piloting tunnel-boring machines to cut through the London clay as they replace the capital's "ageing electrical supply routes".

The Wandsworth section of the tunnel. Photo Glenn Copus

Two tunnels are being dug and when complete they will stretch 20 miles, as demand for power in London rises at double the national average. The first tunnel runs east-west from Willesden to Hackney, and the other runs north from Wimbledon and will connect to the first one at Kensal Green and the Crossrail substation.

The three-metre-wide tunnels will also be used to bring renewable energy from the Thames Estuary into the main network. The project is due to be completed in 2018. The tunnels are designed to last 120 years and the 400,000-volt cables inside for 40 years.

Up to 100 truckloads of spoil, mostly clay, are created every day, and used to fill in the voids in the ground at sites of former gasworks.

SOURCE: *London Evening Standard,* 17 February 2014

Crystal Palace High-Level Station Subway

The Friends of Crystal Palace Subway hope to capture memories of the 1st class ticket holders' polychrome brickwork subway below Crystal Palace Parade in south London. They have received a £10,000 HLF grant for the purpose. The High-Level station (the second to serve the entertainment centre destroyed by fire in November 1936) opened to passengers on 1 August 1865, was closed in the last year of World War II (22 May 1944) and reopened after the war (4 March 1946). However, it had lost its purpose when the palace burned down, and was finally closed on 20 September 1954. Your former Chairman remembers the station in its last years (probably about 1952), as a very empty and deserted place, with one short train standing at a platform but not a single passenger in sight.

The subway under Crystal Palace Parade seen from the south side. Photo Nick Catford

Whether the subway to the Palace remained in use after the fire in 1936 is not clear, but seems unlikely. At the very latest it would have remained accessible until 1954. However, it seems most likely that it was closed when the 'palace' burned down. It was provided exclusively for the use of 1st class rail ticket holders. Passengers with second or third class tickets had to exit the station via the main entrance and cross Crystal Palace Parade in

the open air, and (possibly) rain. It may be that almost the only surviving memories of the subway are of those who visited during the occasional open days organised by a local society in the 1980s.

The subway is not so much a tunnel as a wide and capacious undercroft with a very colourful brick vaulted ceiling. It was spacious enough to accommodate local groups' stalls and displays during open days.

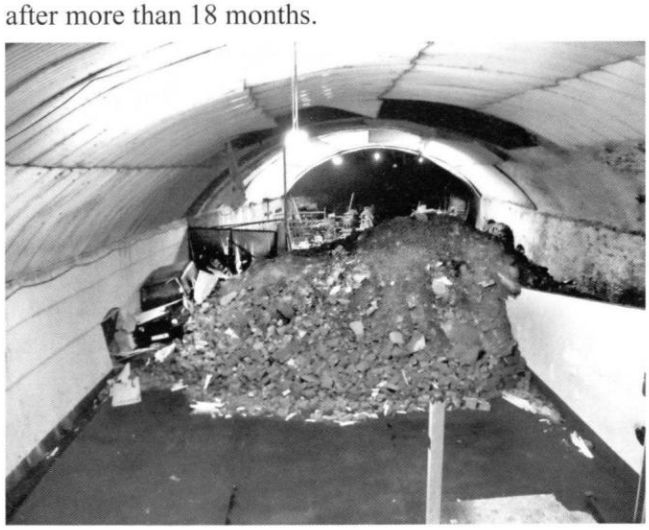
The relevant 1870 Ordnance Survey plan shows that the subway was approached from the platforms at the London end of the station, with glazed roofs between the station and Crystal Palace Parade, and between the Parade and the 'palace'. As the station platforms were at a considerably lower level than the road, there would have been plenty of steps to climb. The 'palace' side flights of stone steps can be seen today, although all the glazed roofs have gone.

The High-Level Station building has long since been demolished, and replaced by modern housing and a NHS centre. The western (station) end of the subway is bricked up. The steps down to the subway at the Palace end can be seen behind security fencing on the east side of the Parade. The Friends have an email address at inspired@cpsubway.org.uk or can be contacted (Sue Giovanni) by telephone at 07956 861052. They would be very pleased to hear from anybody who has visited the site. The subway will be open during London Open House Weekend, 20–21 September 2014.

SOURCE: ANON, 2014, Memories of subway. *Croydon Guardian,* 15 January 2014

Dingle residents back home at last following tunnel collapse

Repair work has been completed on the Liverpool Overhead Railway tunnel at Dingle which collapsed in July 2012 – see *Subterranea* 31 (December 2102). Residents who were forbidden to live in their homes after the tunnel roof fell in have finally been allowed to return after more than 18 months.



The collapse at the site of the former Dingle station

A total of 11 properties above the tunnel were evacuated for safety reasons – eight in Sundridge Street, one in Toxteth Grove and two in Dingle Grove. Residents were initially told the evacuation was only a temporary measure and they would be able to return after 48 hours. They now face the monumental task of making their homes fit to live in again after being left empty and unheated for such a lengthy period of time. One resident returned to find his property flooded and a gas leak outside, while all will need extensive work to make them habitable. A number of the houses are privately owned, which means all the work is being carried out at residents' own expense.

But Liverpool city council has helped clear the front yards of homes and provided skips to collect household items such as furniture which can no longer be used. It also appointed specialist engineering firm SES Contractors to repair the tunnel and make it safe, after brokering a deal with insurance companies to fund the work.

The council said it was not in a position to provide decorating allowances and its main role had been to mediate with insurance companies to get the tunnel repaired and allow people to return to their homes. Ward councillor Hetty Wood said: "The residents have endured a very stressful and frustrating time." The tunnel had been used by a car repair firm, Roscoe Engineering, for a number of years prior to the roof fall.

SOURCE: *Liverpool Echo,* 27 February 2014

Derelict Yorkshire railway tunnel could become cycleway

A derelict railway tunnel in Queensbury, blocked for decades, could soon become one of the longest underground cycleways in Europe, and link Halifax to Bradford.

Built in the 1880s, the tunnel was part of the Great Northern Railway line that linked Queensbury, Keighley and Bradford. When the line shut in the 1960s the tunnel, over a mile and a half long, was closed. Since 2005, large stretches of the rail line have become a traffic-free cycle and pedestrian route – the Great Northern Trail, allowing people to enjoy the journey that takes in Queensbury, Thornton, Denholme and Cullingworth. But the tunnel has caused a break in the route that local groups and sustainable transport group Sustrans have been trying to fix.

Inside the Queensbury Tunnel. Photo Craig Hannah

The Highways Agency is responsible for the tunnel and confirmed it will carry out maintenance work in the coming years. Now there is a push for this maintenance to include a cycleway that could attract cyclists and ramblers from around the country.

Last year Sustrans completed a similar project in Bath. Only slightly longer than the Queensbury tunnel, this is now the longest underground cycle tunnel in Europe.

Supporters believe that the tunnel would not only boost the trail, but become an attraction in itself. With a generation of youngsters soon to be inspired by the 2014 Tour de France passing by their homes and schools, the tunnel could be an even further boost to local cycling, as well as helping increase visitors to villages like Denholme, Thornton and Cullingworth.

SOURCE: *Bradford Telegraph and Argus,* 27 January 2014

Proposal for a road tunnel in 1828 at Ditchling, Sussex

Early 19th-century newspapers are an invaluable source of scraps of information not to be found elsewhere. SB member Martin Snow of the Sussex Industrial Archaeology Society, for example, has found some information on an unimplemented turnpike road proposal for Ditchling, in Sussex.

The *Sussex Advertiser & Brighthelmstone Journal* for 25 August 1828 contains mention of a 'Prospectus for an envisaged New road by tunnel through Ditchling Bosthill to London'. A tunnel 1,500 feet long was proposed. There was already, by 1824, a road tunnel at Reigate, and there would have been one at Highgate, London, if it had not fallen in before completion in 1812. Two were completed on turnpike roads in Dorset in the 1830s, as was one in Kerry (Ireland) in 1836–37 and another in Nottingham in 1855.

SOURCE: SNOW, Martin, 2014, A turnpike tunnel proposal. *Newsl. Sussex Industrial Archaeology Society* 161

New road tunnel run in Stockholm

The Norra länken (North Link) project in Stockholm is Sweden's largest road project. It is a new motorway running between Norrtull and Karlberg, where it connects to Essingeleden. The road is part of European route E4 and E20 and the incomplete Stockholm ring road.

The 'North Link' will, when finished in 2017, make traffic easier in the Swedish capital. Five km of new roads are currently under construction of which four km is in tunnels that are decorated with artistic scenes. The new road will ease up the traffic flow in the northern parts of Stockholm. The new road will open in stages. The first stage will help heavy traffic travelling to and from the ferries to Finland. To celebrate the opening of the first stage a tunnel run will be held in that section. The 10 km run for a maximum of 30,000 participants will be held on 22 November 2014. For more information see

www.lidingoloppet.se/sv/tunnelrun/Norra-Lanken/ and www.trafikverket.se/norralanken/

SOURCE: Lars Hanssen

Crossrail now 50 percent completed, London

More than half of the 42 kilometres of running tunnels for Crossrail have now been completed. And another 12.5 kilometres of sub-surface station tunnels have been finished. Authority has been given to complete fitting out the Woolwich Station box. All tunnelling is expected to be completed by the end of 2014. There is obviously much else to do, such as installing track, signalling, and ventilation systems, and equipping stations with escalators, ticket halls, and so forth. A 'half-time' review gives details of plans and progress with the new Crossrail stations.

SOURCE: ANON, 2013, Half-time for Crossrail. *Modern Railways* 70 (783)

Reopening of the Borders Railway and Bowshank tunnel at Galashiels, Scotland

The 98-mile 'Waverley line' through the Scottish borders from Carlisle to Edinburgh closed in 1969, said to be one of Dr Beeching's most ill-advised closures. A substantial length at the Edinburgh end is scheduled to be reopened in 2015, including the Bowshank tunnel at Galashiels. Special arrangements are being made to accommodate bats known to hibernate here.

SOURCE: ANON, 2013, Light at the end of Borders tunnel. *Railwatch* 137

Railway tunnels along the cliffs, East Yorkshire

The Yorkshire coast, from Whitby northwards to Saltburn and the Tees, has it all, from holiday resorts to mining and heavy industry. A railway along the top of the cliffs from Whitby to Loftus (near Saltburn) was first suggested in 1863, and a company was authorised by Act of Parliament to build one in 1866. Construction of the line did not commence until 1871, and it was not completed and opened until 1883, taking almost a year for each mile of line.

The work called for much heavy engineering, with eight stations, five viaducts, and three tunnels. The whole line, and certainly the tunnels and viaducts, seems to have been single track, other than passing loops. Engineers and contractors were sacked and replaced, plans changed during construction, and sections of line abandoned and bypassed. The line served ironstone mines, alum works and a steelworks. A short stretch at the north end, including the Grinkle tunnel, continues to serve the Boulby potash mine, and steelworks at Skinningrove. Traffic on the rest of the line ceased completely on 5 May 1958, making it a pre-Beeching closure.

The three tunnels are Sandsend (or Deepgrove) 1649 yards; Kettleness 308 yards; and Grinkle (earlier Easington) 990 yards; only the Grinkle tunnel remains in use. Saltburn, at the end of a branch line, is still open as a passenger station, although now only a 'bus shelter' style terminus (the former rather grand North Eastern Railway station building nearby has been converted into shops).

SOURCE: WILLIAMS, Michael Aufrere, 2013, the viaducts and tunnels of the Whitby–Loftus line. *Jl. Railway and Canal Historical Soc.* 218 / Paul Sowan

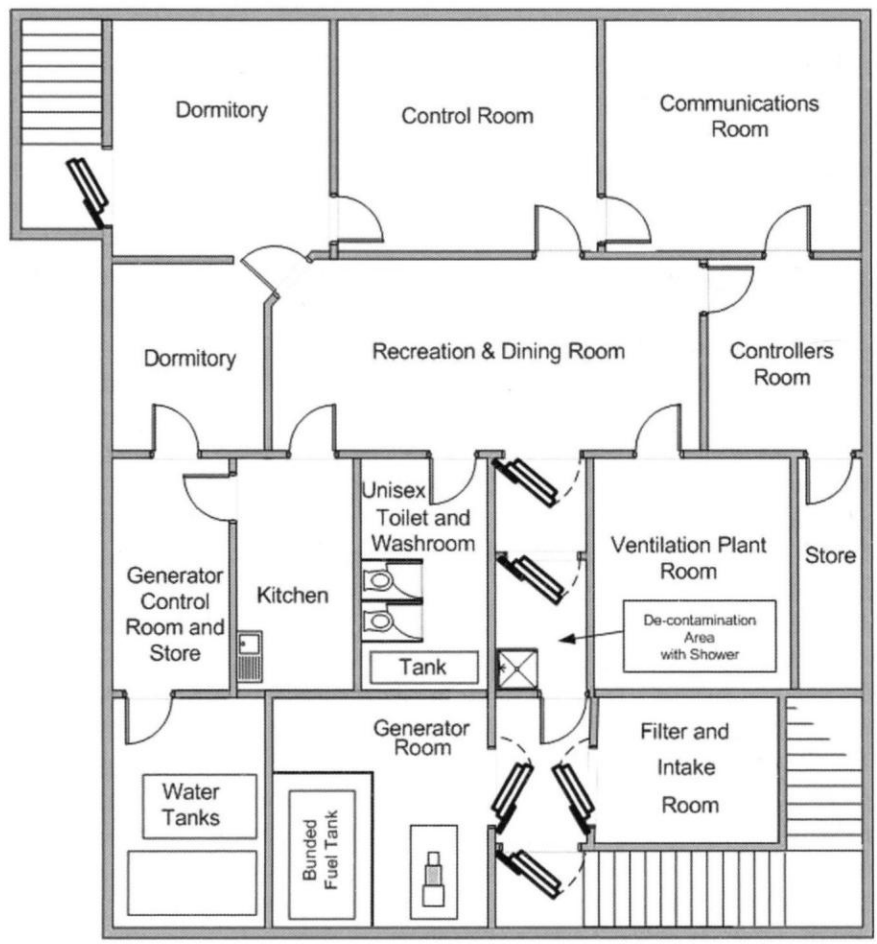
Delights of Devon – UK Study Weekend, September 2013

Stephanie Goffin

This year's Study Weekend was based in Exeter, visiting sites scattered across the county of Devon from our base at the University. The spread of sites was matched by their diversity and for this we must thank Julian Nowill who arranged the weekend's visits. Linda Dixon took care of admin and accommodation and Martin Dixon produced his usual excellent pack of site notes.

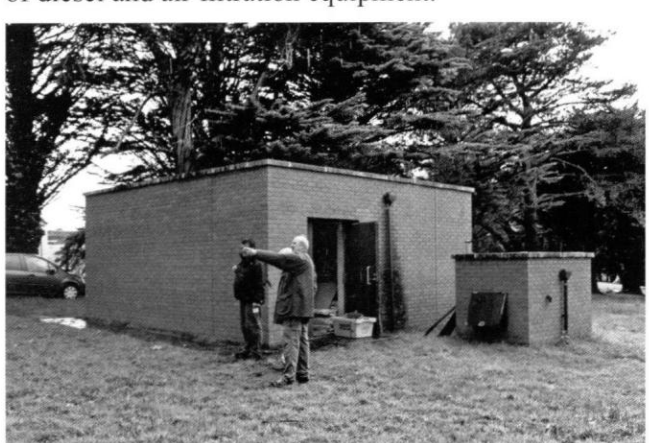
Under a Water Bunker

The weekend started early on Friday afternoon with an optional visit to the Coswarth waterworks bunker, courtesy of South West Water. During the late 1980s, central Government made funds available to the soon-to-be privatised water boards to build protected control centres. Prior to this, water boards had operated from local authority premises as part of the wider team. Started almost at the end of the Cold War, many of these control centres remained unfinished and were never actually used either in practice or in anger, so to speak.

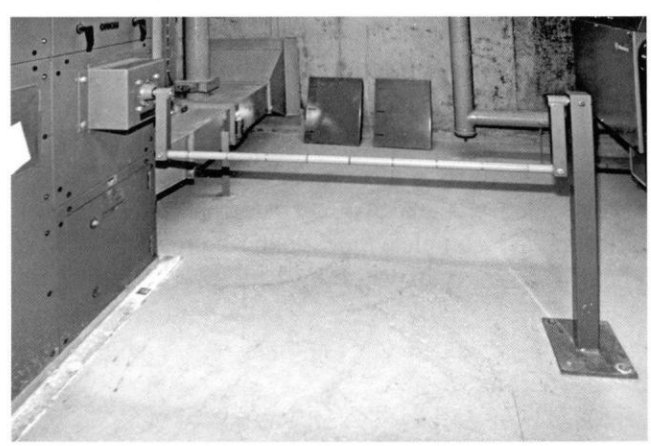


The 3,000 square foot bunker would have housed sixteen people in the event of a nuclear conflict - seven in the operations room, six in the communications room and three in the control room. The rooms were numbered with recent spray paint as part of an upcoming sale of the now-redundant site. Drawn by Nick Catford, adapted from an original by Dan McKenzie

We were met by Jim Street who gave us free run of the bunker after checking the site over himself. Entrance was via steps from a brick-built surface building – so innocuous looking that a couple of members walked right past it, thinking it was a surface store. Three short flights of stairs led down into a substantial pair of blast doors and air lock with decontamination showers between. Side rooms held a generator with perhaps three months' supply of diesel and air-filtration equipment.

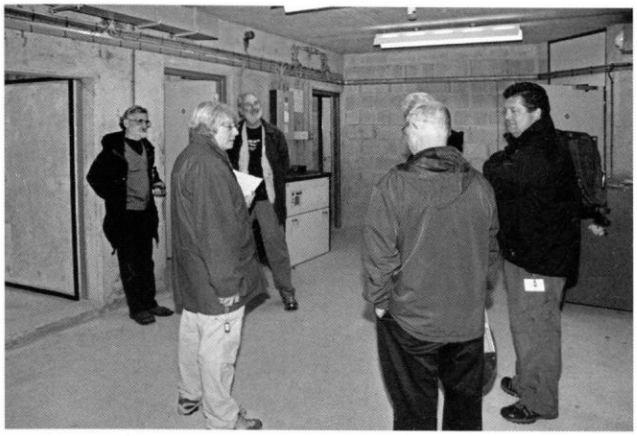


Access to the bunker at Coswarth is via this unassuming flat-roofed brick building. The brickwork on each side shows unusual vertical breaks in the mortar bonding. Photo Martin Briscoe



Emergency hand-ventilation crank at Coswarth bunker. Photo Martin Briscoe

Inside the bunker proper the walls and floor were bare concrete and the layout almost identical to the contemporary bunker at Totnes visited by Sub Brit some years ago. The rooms were almost bare although fully functioning power was live to all rooms. A comprehensive set of water and reservoir plans and some microfiche equivalents took up part of a couple of the larger rooms.



Sub Brit group in the Recreation and Dining Room at Coswarth. The wiring and services are completed to a very high standard but the overall finish is primitive and almost certainly unfinished. Photo Martin Briscoe

The bunker was dry apart from minor seepage at the foot of just one wall. Closer examination yielded a couple of peculiarities. The radio/comms room lacked any incoming cables or phone equipment although a couple of blanked-off cable inlets (as built) were in place. Secondly, the toilets had a urinal but the two cubicles lacked any toilets. It was clear that these had never been fitted as there was no trace of the footprint of a toilet, nor of the pipework leading to the adjacent sewage tank. It seems that the final stage of the bunker fit-out was never carried out – although why a contract for the urinal and soil tank complete with ejector pump was implemented without conventional toilets seems bizarre.

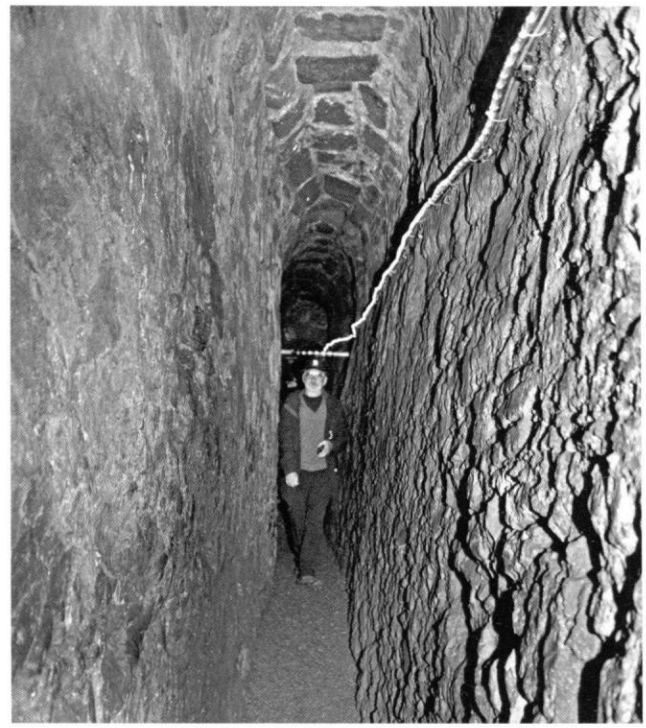
The only door we were unable to open led to the emergency exit, although the metal plates on the surface covering its location were easily identified. All in all this was an intriguing and unusual example of a late Cold War bunker – enhanced by having as much time as we wanted from our generous host.

Conduit Street

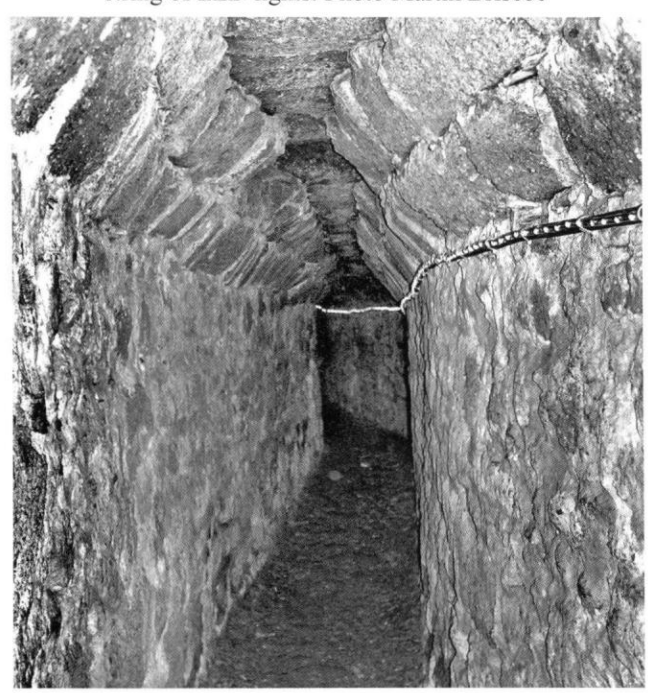
Our second trip of the weekend was a guided tour of Exeter's underground passages. These passages were initially built to provide the Cathedral with water and were subsequently expanded. The first water supply dates back as early as the twelfth century but the early pipes were laid in back-filled trenches. In order to make leak detection and repairs easier, later pipes built in the fourteenth and fifteenth centuries were positioned in finely worked cut-and-cover underground conduits.

As the network grew, the supply was also used for St Nicholas Priory and public water fountains. The passages have been open to the public since the 1930s, but they stayed open specially for members of Sub Brit for an after-hours visit on the Friday evening. We visited in small groups of around fifteen which meant we could hear the guide's commentary more easily.

After waiting in a small gallery with a display of photographs and artefacts relevant to the passages, we were shown a short film. We were then ready to embark



Mike Stace gives scale to the Exeter conduits. The rock-cut sides and slab roof can be clearly seen. The lighting is a string of LED lights. Photo Martin Briscoe



Exeter water conduits showing the cantilevered roof supports. Photo Hugh Ainsley

upon our 30-minute tour of three of the passages. Having donned blue hard hats, we were led along Castle passage by our tour guide. Like all the passages we saw, Castle passage had been constructed from blocks of lava rock quarried from the nearby village of Silverton. The passage was about 5' 2" in height throughout most of its length and it was also about the width of one person.

At the end of Castle passage, we arrived at what was described as the Civil War guard's station, which was characterised by a small ledge. The passage itself

continued in the form of a very small conduit which would never have been navigable by human beings. This, of course, didn't stop some members crawling along it to meet up with the main party later.

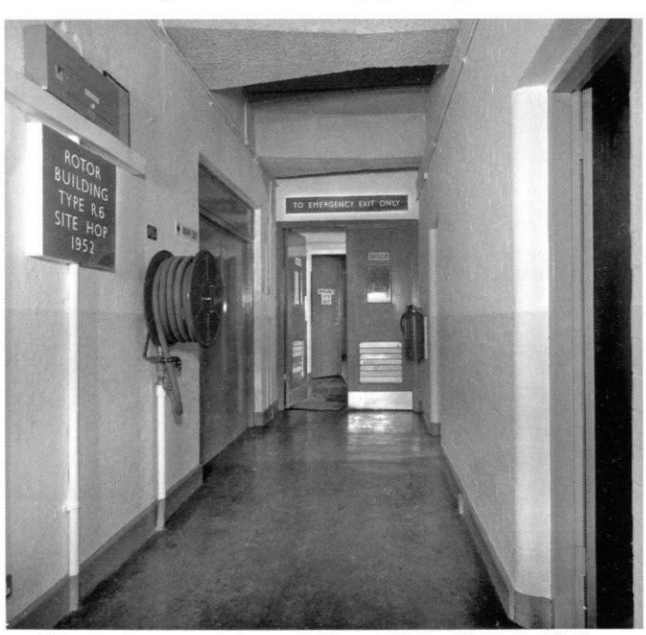
At the guard's station, we turned right along City passage until we reached a brick wall at the end, which we were informed was under the John Lewis department store in the street above. Having reached this dead end, we walked back along City passage until we arrived at the junction with Cathedral passage. Here we turned left and we walked along Cathedral passage for a short distance before turning back and eventually joining City passage again. At this point, we filed back to the entrance. Some of the groups were then treated to an 'off piste' excursion along an unlit portion of Cathedral passage which involved more crawling around modern-day Acrow supports.

Although it was not a very long visit, it provided us with an exciting glimpse of Exeter's subterranean network of passages and it got the weekend off to a flying start. The small groups made it easier to find a pub or restaurant to eat together and get to know fellow members. Sooner or later we all retired to our accommodation at Exeter University. We were in double-bedded en suite rooms with full WiFi and room safes – it wasn't like that in my student days!

Travelling in Hope (Cove)

The full group – 47 of us in total – met up on Saturday morning. En route to breakfast in another building we passed a cellar door marked 'No Admission (Sub Brit this means YOU!)'.

After a leisurely breakfast, we set off for the former RAF site Hope Cove, also known as Bolt Head, which is situated on the coast near Salcombe. Our driver seemed determined to prove his mettle by piloting the coach down ever-smaller lanes. Eventually on the B3196 our bus met two cars with caravans which then took around thirty minutes to squeeze past. In order to achieve this feat, we had three Sub Brit Chris's (Kenney, Jones and Brown) off the coach in Hi Vis tabards directing the traffic. By now there were about one hundred cars held up in each direction. Moral – don't rely on Sat Nav or assume local drivers have local knowledge.

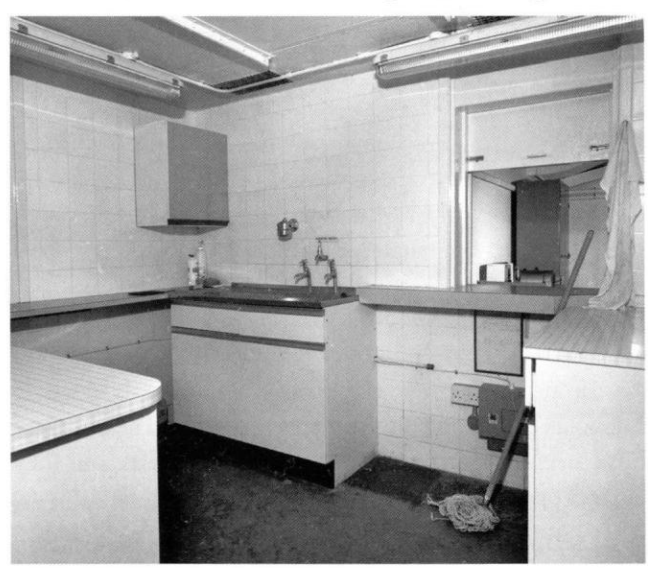


The main upper spine corridor at Hope Cove, with the original site designator and date in the left foreground. Photo Nick Catford

Eventually after two hours on the road we arrived at our destination. Hope Cove was a World War II radar station and a post-war ROTOR R6 site which provided ground-controlled interception facilities for RAF fighter planes. The arrival (not literally!) of intercontinental ballistic missiles at supersonic speeds brought an end to the obsolete ROTOR system just a few years after implementation.

After this phase of its history, the site was used as a secret Regional Seat of Government (RSG) and later as Regional Government Headquarters (RGHQ) 7.2. When RGHQ 7.2 was transferred to Chilmark in Wiltshire in 1989, Hope Cove's days of use as a government establishment were finally over. We were fortunate enough to be granted permission to visit the site by its current private owners. We were welcomed by Chris Howell and given free run of the extensive complex.

From the outside, Hope Cove has the appearance of a large concrete block, although a look at the rear façade revealed some overhanging structures and an appended glazed outbuilding. We entered the building through the door which was located next to the tarmac drive and, after mounting a flight of steps which were situated under a rather interesting-looking pulley system, we found ourselves at the start of a labyrinthine network of corridors and assorted rooms which were spread over two levels, the bottom level being semi-underground.

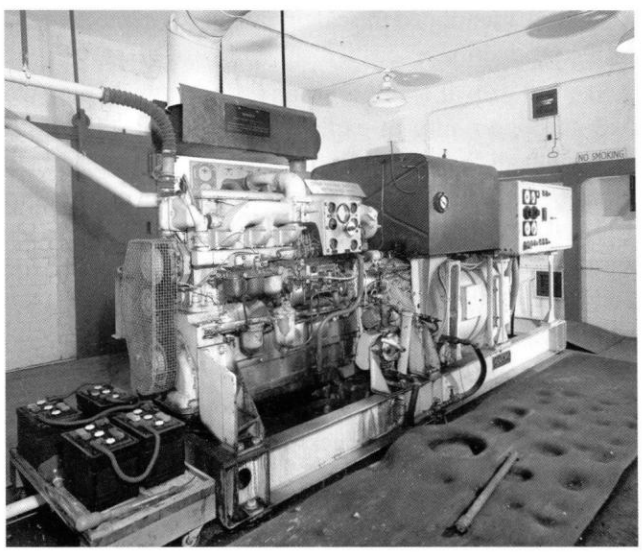


Kitchen and serving hatch at Hope Cove. Photo Nick Catford

Along one of the ubiquitous yellow corridors, we came to a desk which was adorned with a number of RAF-related documents. To our left, there was a large 'operations'

room which was full of a variety of material relating to World War II, local history, the RAF and other related subject-matter. This supply of contemporary materials tended to be typical of the whole building. While some rooms had been stripped bare, others contained documents which appeared to have been left behind by the original occupants or which appeared to be typical of such government establishments.

Some of the original infrastructure was still present, for example the building's impressive diesel generators. The fire-detection fusible wires which would have shut down the generators were still in place. Also still in place on the upper corridor was the original Rotor sign dated 1952 and with the code R6 HOP despite the many years since ROTOR had been disbanded. The main two-level operations room had however been boarded over and used as separate offices.



Well preserved diesel generator at Hope Cove.
Photo Nick Catford

Door signs from RAF days had been repositioned on doors thus 'leap-frogging' the RGHQ days, for example signs pointing to sanitary facilities for Officers. There were also some clues as to some of the structure's more recent uses, such as signs pointing to rooms used for dance classes. Some of the rooms had recently been used for an art exhibition and had the remnants of mounts and other paraphernalia. Perhaps the most curious example was a former telephony room which was now being used to house someone's extensive collection of outboard motors.

A ground-breaking experience

After leaving Hope Cove, we again travelled along scenic country roads and once again encountered some problems, this time in a village called Gapstone, where we found ourselves travelling along an unlisted road which was eventually signed as 'unsuitable for motor vehicles' with a 6' 6" width restriction. Our driver hesitated but from now on navigation was under the control of Sub Brit as Satnavitis had again led to our problems. Turning back proved to be the right decision – Dom Jackson later told us he'd had difficulty navigating the road beyond in his Land Rover!

After being directed to go through Buckland Monachorum, we eventually arrived at Morwellham Quay at 1430hrs, encountering yet more difficulties as the coach became grounded in the driver's attempt to negotiate the steep downward access to the site which sees hundreds of coaches a year. At this point, we all alighted from the coach, leaving the poor driver with the problem of disembedding the front left-hand corner of his coach from the tarmac.

Having entered the site from the wrong direction, we had to walk to the ticket office at the other end of the site for payment formalities. We then headed back towards the narrow-gauge railway which takes visitors to the George and Charlotte copper mine – its entrance is cut into the side of a hill overlooking the River Tamar. As we walked back past the entrance to the site, we were relieved to see that there was no longer any sign of the coach, so it was clear that the driver must have succeeded in dislodging his beached vehicle.

We climbed up a steep woody incline and reached the battery-driven tram train which was waiting for us on the half-mile stretch of 2-feet (61 cm) gauge track. Our guide and driver, Mine Manager Rick Stewart – known to many of us from NAMHO weekends – welcomed us.

Rick Stewart at the controls of the battery loco *Jane* taking part of the group into the George and Charlotte copper mine at Morwellham. The train operates on 61cm gauge track.
Photo Martin Briscoe

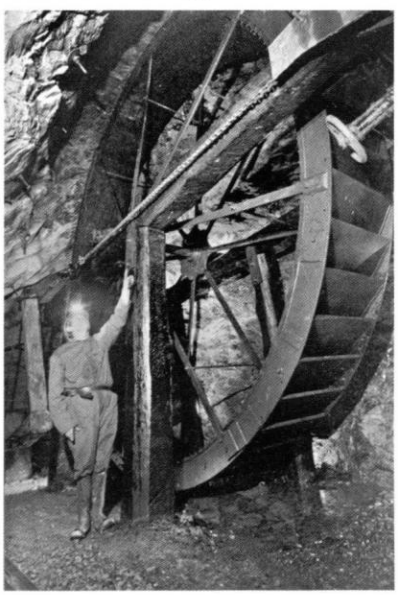
Underground train ride

We squeezed ourselves into the three narrow carriages with their semi-partitioned solid metal and wire mesh fronts and clattered off on our journey, stopping when we came to a sign which read 'Danger Old Mine Shaft – Keep Off'. There was also another sign which read 'Footway shaft underneath'. At this point, Rick was heard to radio 'Rick to Phil' on his walkie-talkie before we turned left into the mine.

After about 40–50 yards, we came to the Devil's Kitchen lode, which is about eight feet across. A bit later, we came across a waterwheel which was operated by an iron hand-wheel. This waterwheel was not the original

Battery loco *Mary* approaching the George and Charlotte Mine portal. Photo Nigel Dibden

structure, which is believed to have been located nearer to the entrance. We were told that this waterwheel had been included on the tour in order to provide visitors with an idea of how such waterwheels were used to relieve mines of flooding.



The replica waterwheel within the George and Charlotte Mine at Morwellham in 1987. Photo Morwellham Quay

There are only five accessible underground waterwheels in the UK. Derelict wheels can be found at Ystrad Einon and Nenthead and a poorer example at Allenheads. There are also two in tourist mines at George & Charlotte and Killhope. Although the Morwellham wheel is a 1980s reconstruction, it uses some genuine parts. The axle is believed to have come from Belford Mill near Ashburton and the rims are from one of the Bovey claypits.

Our aluminium hard hat-clad guide informed us of all kinds of interesting facts. We learnt that the mine had been worked on eight levels (the bottom four now flooded) and that it had been 850 feet from top to bottom. We heard how seven- to eight-year-olds had worked on the surface before starting to work underground when they were perhaps eleven or twelve, becoming skilled miners by the time they reached their late teens.

We also learnt that it had taken five to six hours to bore a slot hole into the rock using a borer and a sledgehammer, this being necessary so that gunpowder could be placed in the rock and fired. We also heard about the role of the *bal* maidens, who used to process copper ore at the surface, all such processing being undertaken by hand. *Bal* is the Cornish word for mine; reminding us that Cornwall was literally a stone's throw across the River Tamar below.

The typical working week here had been eight hours a day for six days a week and it had been possible to earn £6 a month, which was a reasonable wage in the early part of the nineteenth century. The demise of the mine had come after the arrival of cheaper foreign imports of copper, which had caused the workers to move to more profitable mines in Cumbria, County Durham and abroad, with the mine finally being closed in 1869.

On leaving the mine we could see a bent stack on a hill in the distance. This had been part of another works which had been established in the course of diversification in the area. Rick mentioned the calcining of ores in the process of the production of pesticides.

After our trip into George and Charlotte Mine, we had an opportunity to explore the rest of the restored Morwellham Quay area. One member of the group, Mark Goffin, had visited the site when it first opened in around 1972. He could remember the docks being completely silted up at that time, so he was pleased to see that the ketch called the *Garlandstone* had now been released from its muddy repository.

Other particular points of interest were a manganese mill (manganese ore also being commonly mined in the region), a bread kiln, a lime kiln, a blacksmith's smithy, a carpenter's workshop, a cooper's workshop and assayer and wharfinger Mr Medlen's Copper Ore Cottage. The on-site pub sadly no longer has its licence and has become a cafeteria.

The 32 foot diameter overshot waterwheel at Morwellham Quay, once used for crushing manganese. Photo Martin Briscoe

All in all, Morwellham had provided us with a fascinating glimpse into a past age and (with not a little trepidation!) we boarded the coach for the return leg of our journey. We arrived back at the University in time to freshen up for the weekend's formal dinner which was generously catered.

The 'study' at study weekends lasts well into the night. Photo Nigel Headley

Martin Briscoe received an award under the 'Bunk-air mile' scheme for his journey to Devon – around 1260 miles round-trip from Fort William! Julian and Linda each received a 'thank you' of six bottles of *Tunnel Vision* bitter – brewed by the Box Steam Brewery; perhaps an ale that we should adopt as the society's preferred tipple.

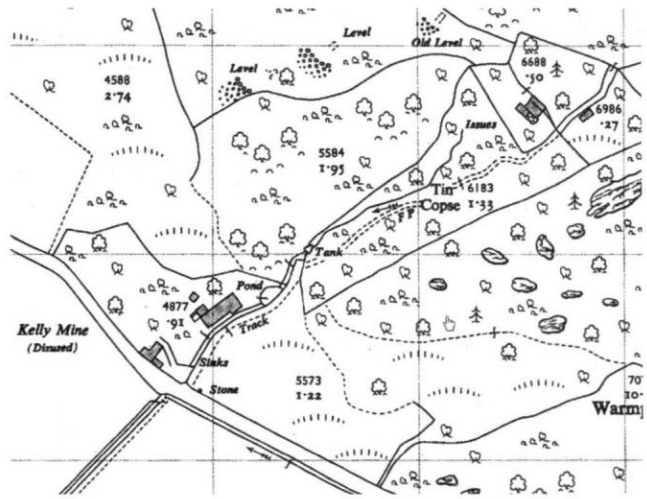
A Four Site Saga

The follies of following a SatNav on Saturday had meant that we'd missed a site from the planned schedule. With a bit of tweaking we managed to fit the missed site into the Sunday programme. Driving distances were less and 'JulianNav' was now firmly in charge. Thus we embarked in good time on Sunday morning for Kelly Mine at Lustleigh to the north of Bovey Tracey. This was a shorter trip and there were no delays this time.

On arrival, we entered a gate next to a small roadside cottage located in a woodland setting. We were greeted by our guide, Judith, who proceeded to show us around the relatively small site which covers an area of two and a quarter acres. We were soon acquainted with the mineral for which Kelly Mine was worked, that is to say shiny battleship-grey micaceous haematite, which is easily recognisable from its waterproof 'fish scales' and which is apparently also known as Devon sand. Although samples were passed round, it was possible to see pieces of the rock ore scattered all over the site.

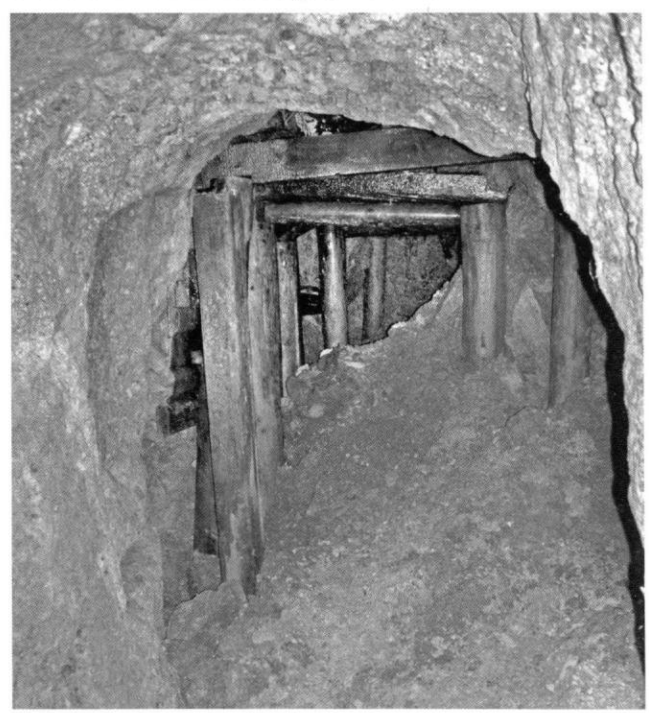
Judith informed us that the mine had probably been open before the 1790s and that it had been worked until 1951. On closure there was a legal dispute between site owner and tenant and as a result the vast majority of equipment remained on site and was not sold off. In almost all other cases of mine closures, machinery and track are lifted and scrapped and lost to the industrial archaeologist. Then in 1984, some employees from Westward Television/ Television South West had formed the Kelly Mine Preservation Society with a view to preserving and restoring the site.

The hillside is riddled with tunnels at many levels. The seams of micaceous haematite had ranged in size from four inches to two feet thick. No more than half a dozen miners had ever worked in the mine at the same time, some of them farming smallholdings in addition to their mine work. The water from the mine had drained into the field over (or rather under) the road and this had resulted in the presence of a large quantity of Molina grass.



1:2,500 1957 OS map showing the by-now disused Kelly Mine. The largest building is the dressing shed with a pond above providing a water supply for the waterwheels on site

Our tour followed a circular route. We were made aware that the small building by the entrance had formerly been a farm labourer's cottage. We were then shown some open-fronted sheds with donated artefacts from other mines in the area. One of these items was a bore mill which had been used at Great Rock Mine, located just over the hill from Lustleigh, in the 1920s.



The collapse at the end of the adit at Kelly Mine. The active volunteer group hope to clear the blockage, resources permitting. Photo Martin Dixon

Once we had walked past the sheds, we came to a junction with an 18-inch-gauge railway track. Judith

then guided us down a gentle slope until the railway track curved round to the right. In the corner, there was a sign saying 'Rope haulage system' and there was also a mobile telephone. An overhead wire (still in working order) operated a bell system for controlling the winch on the incline.

Candle-lit workings

Once we had rounded the corner, we walked to the entrance of the mine. Nigel Headley has a cousin who works here as a volunteer and Nigel had managed to arrange access to the drift as a result of Sub Brit having liability insurance – other visitors have no such luck.

We had the opportunity to walk about a hundred yards along the bottom adit of the mine. The volunteers had atmospherically lit the passage with candles which gave some idea of the working conditions. Sadly the further reaches of the adit have recently collapsed but the volunteers have plans to extend the drift.

A few members were able to visit the neighbouring mine at Hawkmoor, again rarely accessible as it is under separate private ownership so a real privilege. As well as the entrance adit, this trip also showed some of the worked out stopes – now flooded and inaccessible. However the water was crystal clear with a beautiful blue hue to it.

The reconstructed headgear over the 80 feet deep main shaft at Kelly Mine. The restored winding house is to the right. Photo Martin Briscoe

After this subterranean foray into part of Kelly Mine, we walked back up the slope. Once at the top of the slope, we came to an engine shed which contained one Lister and one Bettes engine and their winding sets. Along

1907 shot of mustachioed workers (and a dog) at Kelly Mine

a path, we came to the shaft and were able to take a vertiginous peek down its depth, which is 80 feet down to the bottom level.

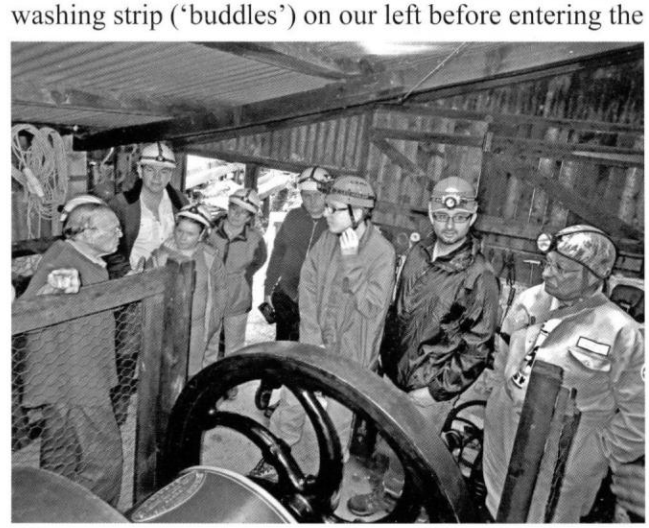
One of the less pleasant aspects of Kelly Mine's history was revealed when we learned that a man called George Drewett had died in 1910 when the wire rope bringing a kibble to the surface had broken and he had been crushed under the iron bucket. Nowadays, improvements in health and safety mean that, when the kibble is brought to the surface, there is a safety trapdoor to prevent the recurrence of such accidents.

Little of today's shaft is still original, as the restorers had only found a broken wall and cover over the area, so a substantial wall has been built, new headgear erected and an engine dating from the 1950s has been bought from somewhere in the Peak District. However, the turntable and the rails to the right of the shaft were original.

After viewing the shaft, we were taken a bit further up the hillside to see another railway track which is in the process of being excavated; this track led to another adit. There was not all that much to see at this higher level, although it was suggested that short posts which were visible might mark the position of a compressed-air pipe.

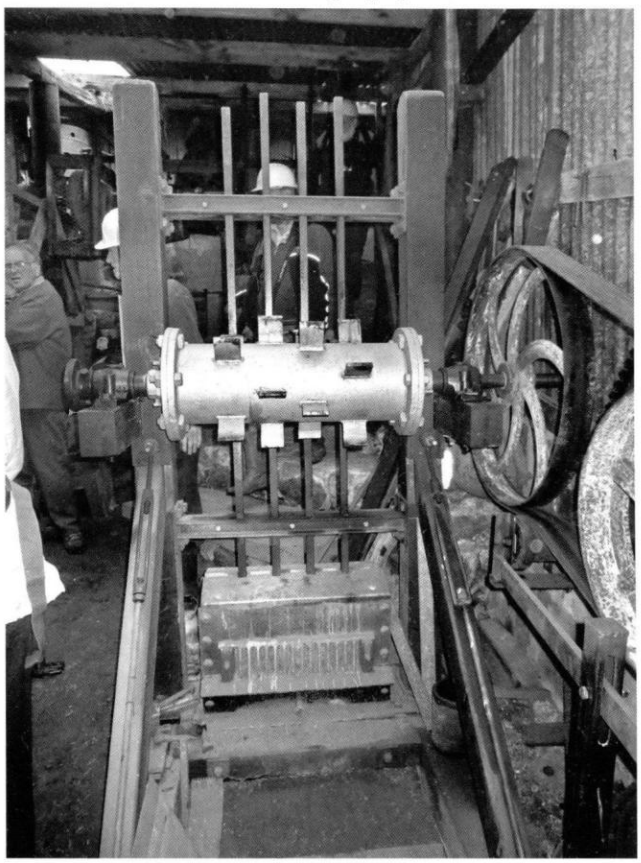
Dressing before dinner

We then returned to the bottom level again, passing a washing strip ('buddles') on our left before entering the



Oil engine which augmented earlier water power at Kelly Mine. Photo Martin Briscoe

dressing shed. As we entered the main room, we were shown an air compressor and a winch, down the middle of which ran a turbine supply pipe. To the right of this, there was a green Blackstone hot-bulb paraffin oil engine from Wales which was being used to drive belts which were in turn being used to operate a cross-shaft linked to other items of ore-crushing equipment.



California stamps at Kelly Mine driven by external waterwheel. Photo Martin Briscoe

Our attention was drawn to one particular pathway in the process which included a set of four-head California stamps (with round heads) which were linked to an Archimedes screw whose underflow passed straight to settling tanks. The overflow passed through washing strips prior to being returned to the run leading to the settling tanks to the right of the exit. On the other side of the dressing shed, we were shown another set of four-head California stamps (with square heads) which were driven by the external waterwheel.

On leaving the dressing shed, we saw an outside settling tank and the final six-feet-deep slime pit into which the ore-processing water flowed. Apparently, samples from the slime pit resemble tree rings, with the rings corresponding to the shifts of work at the mine (with a larger blank space every seventh ring, showing where no work was undertaken on Sundays).

Finally we visited the drying room where the end product – a shiny smooth dark-grey powder with a wide range of industrial uses – was bagged. The building also had a small smithy, now splendidly restored.

All in all, this was a delightful site – the preservation

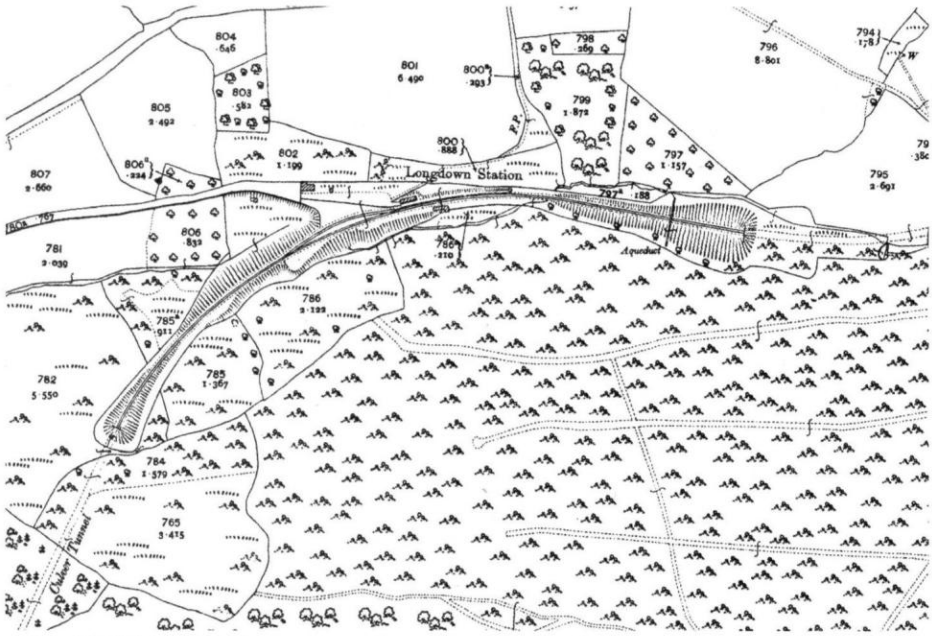
Waterwheel at the dressing sheds at Kelly Mine. It is operable for short periods only due to the restricted water supply. Photo Martin Briscoe

society has done an excellent job and it was a treat to see the whole process on one site. As usual, the weekend's costs had included provision for a generous donation to the voluntary group who had given their time to show us round and who were warmly thanked.

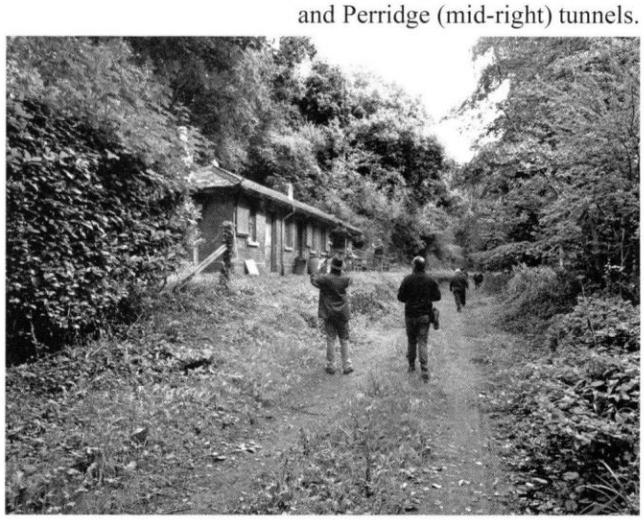
Longdown, Longdown, this is Longdown

Our next port of call was the former Great Western Railway station at Longdown, which was situated on the disused Teign Valley line which ran between Heathfield and Exeter. The station is in a remote wooded location which we reached after walking up a fairly steep lane. It seemed a curious location for a railway station, but the line was apparently constructed for the transportation of minerals, mainly granite, although a passenger service was also operated.

Longdown station in 1904 from the same position as today's view overleaf. Photo John Alsop collection



This 1905 1:2,500 OS map shows Longdown Station between the Culver (bottom left) and Perridge (mid-right) tunnels.

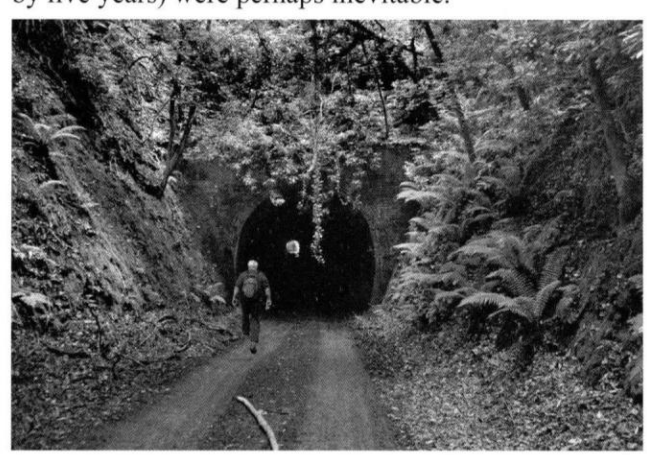


Members admire the well-preserved station and platform at Longdown, on the disused Teign Valley line.
Photo Martin Briscoe

The impressive collapse in the Perridge tunnel - an unusual occurrence on the British Rail network

It was pleasing to see that the station was in a good state of repair and that the original building and platform were still present. The station is positioned between two tunnels – the 836-yard Perridge and the 248-yard Culver. We first walked to the muddy portal of the former but the entrance was firmly gated. There is a collapse midway through the tunnel and all access is prohibited for safety reasons.

However, retracing our steps through the puddles we arrived at the Culver Tunnel. We passed an impressive (and partially underground!) ants' nest on the right, which we were all careful to avoid. In the dark brick-lined tunnel itself, which was negotiable throughout the whole of its length, we were able to spot a few bats as well as a very large white spider-egg sac. This delightful rural location – the station being nearly two miles from a tiny village – made many of us realise that many of Beeching's cuts (which this station pre-dated by five years) were perhaps inevitable.



Hugh Ainsley approaches the north portal to Culver tunnel showing the steeply graded cutting and extravagant plant growth. Photo Martin Briscoe

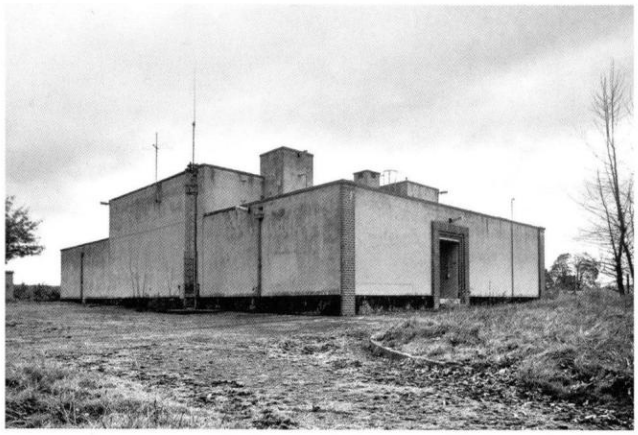
Attack Warning Red (Paint)

After leaving this rural setting, we travelled to the former Royal Observer Corps' No. 10 Group Headquarters which was situated next to an unlisted road in Poltimore Park. The site initially held a WWII RAF Sector Operations Room, but was developed in the Cold War to hold the ROC HQ.

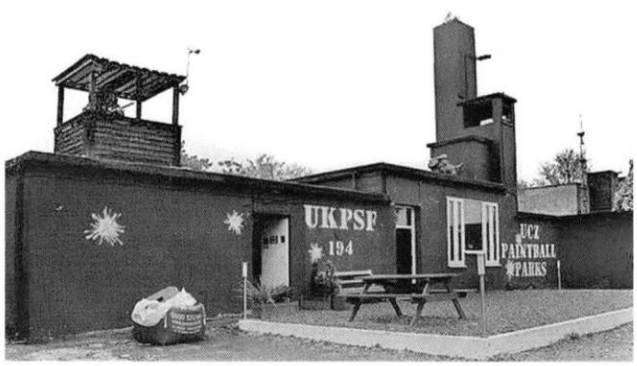
Here, signals of nuclear attacks would be phoned or radioed through from three-person ROC posts. The reports would be collated and triangulated to produce a 'best guess' analysis of the areas at risk from nuclear fallout. In 1991, the site was closed when the ending of the Cold War made it redundant.

There are two buildings on the site, the building on the

left having previously served as the administration block. The two-level structures, of which the lower level is semi-underground in a similar way to the building at Hope Cove, are now used as paintball and lasertag venues.



No 10 Group ROC HQ at Poltimore (Exeter) in 1999, before the site became used for paintball and laser games. The characteristic telescopic aerial can be seen on the left wall and the limited upper storey is clear. Photo Nick Catford



The ROC HQ site today. On the left is the former admin block with the bunker itself visible on the far right.

By ducking and diving under various superimposed structures and through openings which had been cut into the walls, we were able to ascertain that the left-hand building's layout was still intact, including some of the original sanitary installations. However, it was disappointing to see that little else remained. Paintball activity and installed barriers and partitions gave the building something of a feel of entering an early Doctor Who episode!

The building on the right had been purpose-built as the ROC HQ. Combat in this building is limited to laser-tracked battles so the floors and paintwork are in much better condition. A number of doors and hatches have, however, been cut between adjacent rooms, including between the male and female toilets. The building is now Grade II listed as a rare survival of its original type and it is hoped that the fabric can be retained without further deterioration or destruction.

The plant room to the right of the main entrance was still intact. This was opened specially for us, being

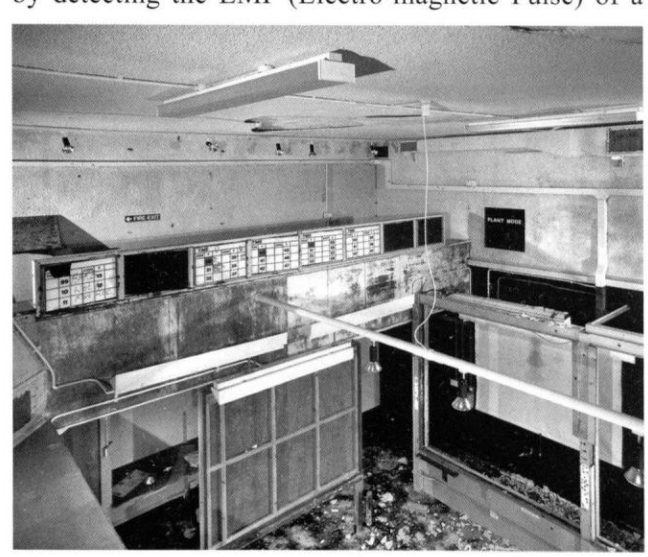
The main Control Room 'well' at Exeter ROC 10 Group HQ. The post tote boards can be seen around the balcony. The woodwork in the foreground is a recent addition for the laser games that use the site today. Photo Dom Jackson

normally off-limits to today's combatants. The first piece of equipment which was encountered on entry had been intended to ensure that the air pressure of the building was maintained at an overpressure in order to prevent air ingress in the event of a nuclear attack.

On the top floor of the building, which it was possible to access by bending double under superimposed panels and climbing up some stairs, the original gallery around the central well appeared to have been maintained and there were still some artefacts, for example tote boards and some phone racks and sockets.

One of the sockets was still marked (in Dymo tape) with AWDREY, which stood for **A**tomic **W**eapons **D**etection **R**ecognition and **E**stimation of **Y**ield – an automated system for the detection and quantification of nuclear strikes. It was installed at just thirteen of the 25 ROC HQs plus at most RGHQs.

AWDREY estimated the yield in megatons of a strike by detecting the EMP (Electro-magnetic Pulse) of a



The Control Room well in 1999, showing the deterioration of the listed building over the last 15 years. Photo Nick Catford

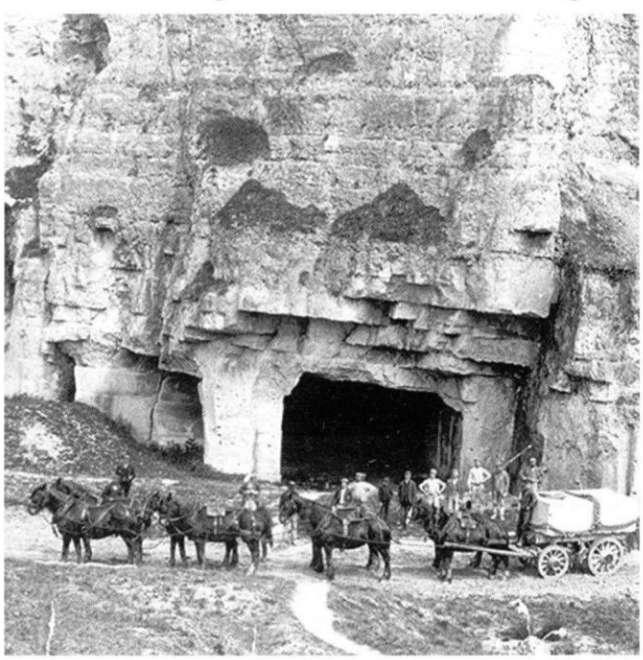
detonation. False alarms were apparently not uncommon during thunderstorms which suggests an incoming Soviet attack in heavy rain was most likely to escape detection. This small label was a fascinating reminder of an early top-secret application of computing; sadly the adjacent cabinet is now empty.

Beer – down the hatch

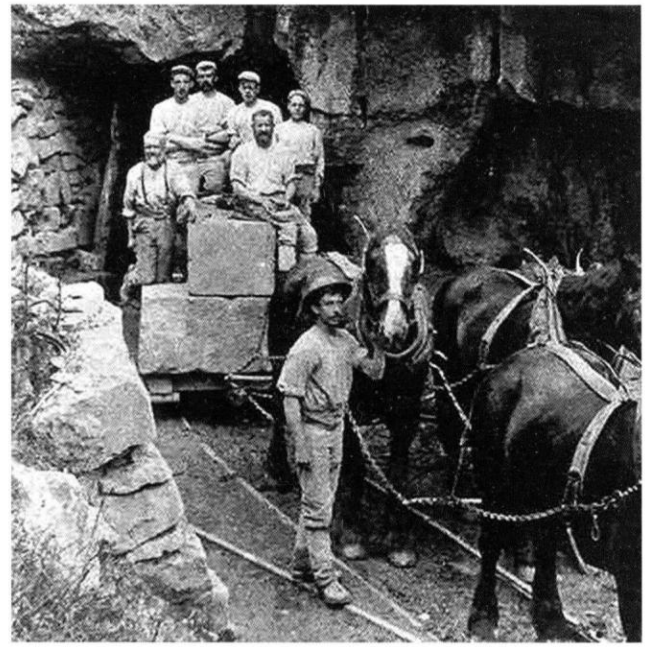
Our final visit of the day was eastwards to Beer Quarry, which is the oldest continuously worked industrial site in Britain, having started in operation under the Romans in 50 AD and having eventually closed in 1920. At present, only two percent of the workings of this former Cretaceous limestone quarry are open to the public, although a total of 75 acres have been opened up and there are still 18 entrances which are hidden. It was interesting to hear that Viking and Roman artefacts were still being found.

The approach to the portion of Beer Quarry normally open to the public. Photo Martin Briscoe

We were lucky to have secured the services of leaseholder John Scott as our guide for the visit. John first opened



An eight horse and cart removing stone from Beer Quarry in the 1920s



Another 1920s shot of stone extraction on the Beer Quarry tramway.

the site to visitors in 1984 and has since spent countless hours exploring, documenting and recording the site. The main part of the extensive mine consists of cavernous open spaces which are supported by mainly square pillars. The only departure from this was the presence of an altar which was thought to have been part of a secret Catholic church. All in all, the limestone vaults were quite a majestic sight.

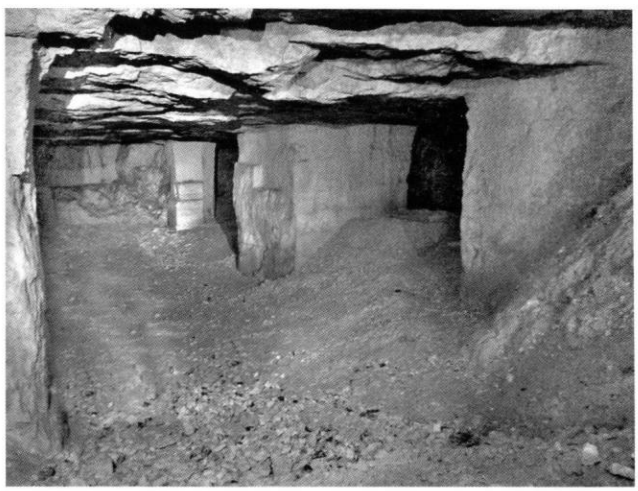
However, we were soon made aware of how harsh the working conditions had been for the quarrymen. John's grandfather had worked in the mine and he told of continuing rivalries between the descendants of quarrymen and stonemasons in the village of Beer. We were able to understand the reason for this tension when we heard of the conditions which the quarrymen had been required to endure.

Although the stonemasons had to work on the blocks of limestone underground, their working conditions had been much more favourable. The quarrymen had to buy five candles every morning and they would then spend the next fifteen hours working to extract a block of limestone in a temperature of 53°F and in an atmosphere of noxious fumes from the tallow of the candles. If a man called the tapper found the blocks to be flawed, the men would return home without being paid. There was also the risk of landslides or falling limestone.

We saw a part of the roof which had collapsed in 1758 and which had caused the death of 48 men and one boy. As successive Bishops of Exeter Cathedral had owned Beer Quarry for centuries, this had given rise to feelings of resentment towards the Church and it was clear that our guide still felt some of this anger – although this had possibly dissipated somewhat following the fairly recent visit of a Bishop of Exeter who had declared that he would never view the beautiful limestone which had been used

to build his Cathedral in quite the same way ever again.

Towards the end of our visit, John told us that he would be happy to take us into off-limits workings a few hundred yards down the road. After months of digging, the entrance had been uncovered just weeks earlier for the first time in perhaps 400 years. Sadly he hadn't told us in advance and, due to the time available and the difficult access, only a handful of us were able to squeeze through a tiny grille and take hasty photographs.



A shot of the Beer Quarry galleries only recently reopened after unblocking debris at the entrance. We were some of the first people to access this part of the mine for hundreds of years. Photo Chris Jones

Nevertheless, everyone else managed to climb over a treacherous chalk slope to at least catch a glimpse of the newly exposed workings. As always, it's nice to have something to return to on our next trip!

And finally...

At this, the end of the formal weekend, we retraced our steps to the University and bade our farewells. About half of the party stayed on an extra night and did their own thing on the Monday. For some this was the catacombs or a walking tour in central Exeter; for others a drive to the Excelsior Tunnel over the border in Cornwall where tests had been carried out in a former tin and copper mine on the seismology of underground explosions. For others, Monday offered a gentle drive home to reflect on a superb weekend of visits in good company.

The Excelsior tunnel, showing the extensive but now decaying roof supports. Photo Nick Catford

News Update

Just before going to press it was announced that the South West Water bunker at Coswarth (the first site visited on the weekend) has been sold at auction for £140,000 to an anonymous buyer. The guide price for the property was £50,000, meaning that it realised almost three times the estimate.

Brian Blake, South West Water's asset performance manager, worked for the Authority at the time of construction and can recall visiting the bunker as it was being prepared for potential habitation. 'I remember that the Government said we had to provide an underground control centre in case of emergency which was bomb and nuclear proof,' he said. 'It wasn't fully kitted out as there was no furniture in there, but if something had happened you could have lived in there for weeks.'

Chris Shapland, the Authority's property manager, added: 'We regularly auction redundant assets to reduce our costs and keep customers' bills as low as possible, but this is the first time we've offered a genuine piece of Cold War history. Several of the Authority's former storage reservoirs and pumping stations have already been converted by their new owners into unusual homes'.

I read it in a book .. it must be true! Beddington Caves, LB Sutton

A description of Beddington, now a part of the London Borough of Sutton, in J. Pigot's *Royal National and Commercial Directory and Topography*, dated November 1839, states that 'In this parish is a cave, wherein, it is said, the barons held a conference the evening previous to their meeting King John at Runnymede, when they compelled him to sign *Magna Charta*; the place is now used as a cellar by an innkeeper whose house is contiguous to it'.

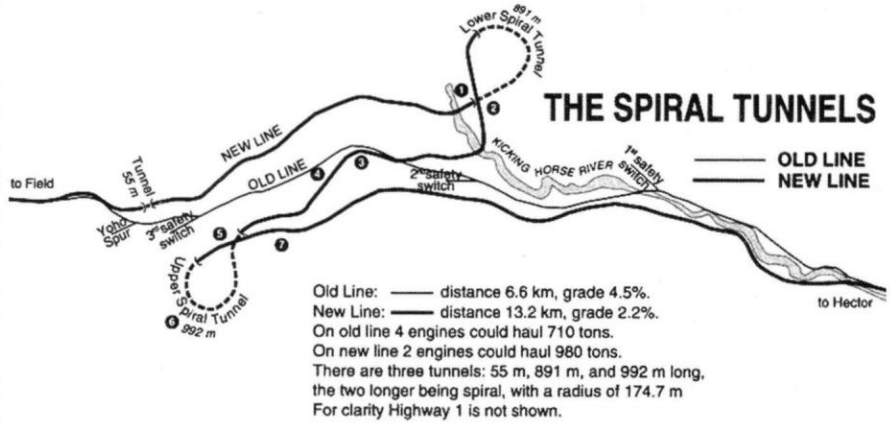
This is complete nonsense, the so-called Barons' Cave being indisputably below the castle at Reigate, first recorded by William Camden in his book *Britannia* in 1586.

The Plough Inn at Beddington, opposite the now sealed entrance to the 'Beddington caves' (which do certainly exist) is listed under Taverns and Public Houses in the same directory, Ann Rowe being the licensee in 1839.

Camden, however, said nothing about the rebellious barons meeting at Reigate. That story first appeared in print in the first edition in the early 1690s of *The new state of England* by Guy Miège, and seems likely to be an early example of cave guide invention.

The spiral railway tunnels at Kicking Horse Pass, British Columbia, Canada

Paul W. Sowan


THE SPIRAL TUNNELS
OLD LINE
NEW LINE
Lower Spiral Tunnel
891 m
Upper Spiral Tunnel
992 m
to Field
to Hector
Tunnel 55 m
Yoho Spur
3rd safety switch
2nd safety switch
1st safety switch
KICKING HORSE RIVER
Old Line: —— distance 6.6 km, grade 4.5%.
New Line: —— distance 13.2 km, grade 2.2%.
On old line 4 engines could haul 710 tons.
On new line 2 engines could haul 980 tons.
There are three tunnels: 55 m, 891 m, and 992 m long,
the two longer being spiral, with a radius of 174.7 m
For clarity Highway 1 is not shown.

The generality of railway tunnels are almost if not entirely straight from portal to portal: tunnelling being a difficult and expensive business at the best of times, engineers have usually taken the view that the shortest possible tunnel is to be preferred. But in crossing mountain ranges where very steep gradients (or very long and very deep and very expensive tunnels) are called for, spiral tunnels have been made to reduce gradients. By taking the line almost on a circle through the mountainside, the horizontal distance needed to climb a given vertical height is extended. Some such tunnels are traversed by Innsbrück – Milan trains via the Brenner Pass, for example. And many people will be familiar with photographs showing the two ends of one and the same train at two tunnel portals one above the other. An excellent example of spiral rail tunnels, easily viewed from a public road and viewpoint, can be found on Highway 1 through the Yoho National Park in Canada.

The Canadian Pacific Railway's Old Line made 1881 - 1885

British Columbia joined the Confederation of Canada in 1871. The eastern and western extremities of this vast land, separated by the uncharted Canadian Rockies mountain ranges, were united by the country's first transcontinental railway in 1885, running between Halifax and Vancouver. The Canadian Pacific Railway's engineers built their line through the Kicking Horse Pass where there was, when construction commenced in 1881, no road; and where the earliest Europeans had first explored as recently as 1858.

In its passage through the Kicking Horse Pass trains on the single-track line had to negotiate the 'Big Hill' – with a gradient of 4.5 % (45 metres per kilometre). A late 1880s fourteen-car freight train weighing 762 tons needed an equal weight of locomotives (four of them) to haul it up. This severely affected the operation and economics of the line.

The Canadian Pacific Railway's New Line and spiral tunnels made 1907 - 1909

The company's engineer, J.E. Schwitzer, faced with the problem of reducing the severe gradient where trains had to climb a vertical height of 130 metres in 7.4 kilometres, looked to solutions already pioneered on the railways linking Switzerland and Italy via the Alps. The St. Gotthard line through the Baischina Gorge gains height by extending the length of line by inserting sharply curving tunnels inside the mountain. Trains travelled a greater distance to make the required ascent.

At Kicking Horse Pass, two single-track spiral tunnels about two kilometres apart were driven through the quartzite and limestone rock. The Lower (Mount Ogden) Tunnel is 891 metres long and forms about two-thirds of a circle, with a radius of 174.7 metres. This results in an ascent of 15.4 metres at a gradient of 1.62%. The Upper (Cathedral Crags) Tunnel is 992 metres long and forms about three quarters of a circle, also with a radius of 174.7 metres. This results in an ascent of 17 metres at a gradient of 1.66%.

Work commenced in September 1907, and was completed on 5 May 1909. Alignments of tunnel headings were correct to five centimetres. At least five lives were lost during the digging of the tunnels.

The overall gradient for the Big Hill was thus reduced from 4.5% to 2.2%. The original or 'Old Line' of railway at this point has now become a part of Highway 1, opened in 1956.

The tunnels have subsequently been enlarged (1992) to accommodate container traffic, and are 5.2 metres wide and 7.6 metres high.

Viewing the spiral tunnels

Apart from catching a train, which in any case doesn't give the best overall view of this civil engineering feat, the spiral tunnels can be seen from public viewing points on Highway 1. Some knowledge of the railway passenger and freight timetables is advisable for those wishing to see trains traversing the tunnels. Passenger trains (being shorter than the tunnel lengths) are not long enough to 'loop the loop' allowing views of both ends of the same train at each end of the tunnel. But an 80-car freight train can be seen looping over itself at the Lower Tunnel, and a 90-car train at both tunnels.

Graeme Pole's excellent little guide book describes not only the history of this astonishing bit of railway, but contains practical local advice, at least as at the date of publication.

SOURCE: POLE, Graeme, 1995, *The spiral tunnels and the big hill: a Canadian adventure*. Vancouver: Altitude Publishing Canada Ltd: 80pp [ISBN 1-55153-908-X]

Site Visits made easy

Martin Dixon

Having organised visits to scores of sites for Sub Brit over the years with Linda, I was asked by a member to jot down a few pointers as to 'how to go about it'. Nothing can guarantee gaining access but following a structured approach does, in my experience, lead to more success. Most of this is straightforward but, as the saying goes, no one plans to fail but usually fails to plan.

Arranging a visit to a vast disused mine obviously needs a lot more preparation than an outing to the Cabinet War Rooms, for example, so do inject a bit of common sense and think of what follows as a guide and checklist.

Choose the site(s)

This could be a site you know locally, or something further afield. If it's been visited before, then the Sub Brit website, or a previous copy of *Subterranea*, should show you who arranged the visit – they may be able to provide some pointers. Particularly if the site is in an out-of-the-way location it may be worth trying to link with one or two other sites to fill a day.

The Sub Brit Directory [available from our website] lists about 250 UK sites that are regularly or occasionally opened, so there's another potential source. Don't ignore active sites – working mines and operational bunkers can make fascinating trips. Even well-known sites that are regularly open will sometimes allow access to parts of the attraction that are normally 'off-limits'. For example in the past we've arranged visits to Dumpy level below Dover Castle and to the control rooms and behind-the-scenes areas at road tunnels and metro systems.

Once a site has been chosen, a useful checklist to apply to planning the visit is the acronym AIRPORT:

- **A** **A**pproach the owners
- **I** **I**nsurance needed?
- **R** **R**isk Assessment
- **P** **P**articipants
- **O** **O**n the Day
- **R** **R**ecord the site
- **T** **T**hank you.

Approach the Owners

Before making an approach, of course, the site owner needs to be identified. It's usually relatively easy to find out owners of 'active' sites but for those that are derelict it can be trickier. The Land Registry offers a facility to search for the Registered Owner of a property by address or via a map search at £3 a shot.

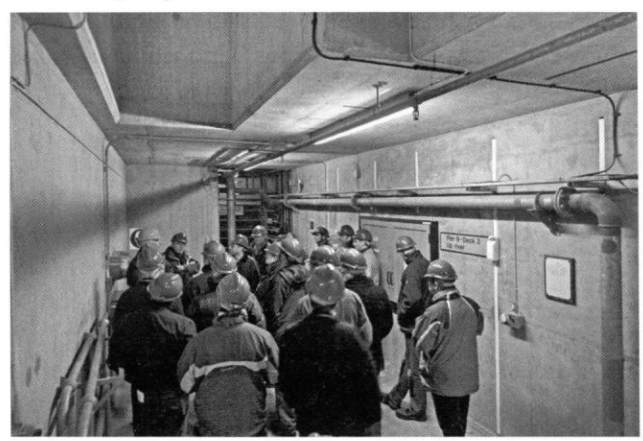
Having identified the owner(s), then unless the site is in single private ownership (when it's obvious!), the question arises of who to contact. There's no simple answer but in general I have had greater success by starting at the top of an organisation rather than the bottom. I've normally found engineers most sympathetic to a visit but have also had help from public relations and even tourism contacts at local authorities. The web is a great tool for identifying responsible officials.

You then need to decide whether to write, email or talk in person. Talking in person would be my recommendation as a first step. That said, an email enquiry is much easier for an organisation to forward internally. And a formal letter perhaps shows a degree of organisation/commitment that in some cases will get a more considered response. If the site is overseas then I'd always suggest email unless you happen to be a native language speaker. You can use Google-translate to convert your email text if required, which is surprisingly effective.

Please don't claim to represent Subterranea Britannica unless you have the agreement of the Committee.

In your initial request I'd suggest clarifying that any attendees would wear appropriate PPE (Personal Protective Equipment) e.g. safety boots, helmets, face masks etc. and that attendees would follow any other guidelines/restrictions relating to photography, number of attendees or off-limits areas.

It is also worth offering to meet the owner's out-of-pocket expenses, or make a charge for the visit which the owner might like to donate to charity. Even if not taken up, the offer may help convince the owner of the depth (pun intended!) of your interest.



Sub Brit visit to Thames Barrier. Photo Nick Catford

Insurance

Some site owners (for example MoD, local authorities) may want the visit to be covered by Third Party Liability Insurance. Subterranea Britannica holds this insurance but **it only applies to 'official' visits and only covers Sub Brit members**. 'Official' means visits that the Committee have approved in advance, so if insurance is a requirement then please talk to one of us at an early date.

Please note that Sub Brit's Third Party Insurance is not in any way personal accident insurance which remains the responsibility of individual attendees.

Risk Assessment

It is always helpful to complete in advance a risk

assessment for a site visit. If the visit is unescorted and/or to a derelict or non-public area, then it should be considered mandatory. But don't be daunted by a risk assessment – it's just a way of making you think about all the possible risks and what you might do to mitigate (avoid) them. There is a suggested blank template on the Sub Brit website at www.subbrit.org.uk/docs/site-risk-assessment-form.pdf. You may need to talk in detail to the site owner to understand some of the possible risks. It's worth keeping a copy of the risk assessment after the visit has taken place just in case there are any subsequent issues.

For any large or complex site, you should insist that attendees sign in and out. Make one of the party responsible for this. Consider how to exit in an emergency and give particular consideration to sites with only a single entry/exit. A first-aid kit is particularly useful in out-of-the-way locations.

The risk assessment should specify minimum levels of equipment for attendees. If a torch is needed then it's always best to specify a working spare. A helmet can prevent scrapes as well as offering some protection against falling objects. If there is any ladder work involved, a helmet-mounted torch is normally a given. Stout footwear – ideally safety boots – is another obvious precaution.

Participants

As organiser, it's reasonable that you decide how to invite attendees. At a few larger sites, numbers are potentially unlimited but at many others there will be limits. Even if you use a private 'guest list', consider opening up some places to fellow Sub Brit members – you're more like to get invited on reciprocal visits in the future!

If you do open up the visit, consider drawing places after a given deadline. The alternative of 'first-come first-served' tends to lead to the same members who are most active on email always being chosen. Some sites may only accept a single visit but others are happy to accept repeat visits. We arranged five separate visits beneath the Thames Barrier to accommodate 120 SB members a few years ago, but the 2013 visit to Brompton Road had to be a one-off for just ten attendees.

If the trip is relying on Sub Brit Third Party Insurance, all attendees must be members, but it's quite in order for people to join Sub Brit in order to attend a specific visit. A waiting list may be worthwhile as illness/work commitments sometimes crop up late in the day and it's a shame to miss a chance to take an extra attendee.

Once the attendees are known, put together and distribute 'joining instructions'. These can be via a simple email, but as a minimum should cover:

- Where to meet and when, duration of visit [NB postcodes can cover a wide area in rural locations so consider a grid reference too]
- Equipment needed (helmets, torches etc.)
- Any restrictions on the visit e.g. photography; escorted or free access etc.
- Risks that you have identified and how attendees should avoid them
- On-the-day contact numbers in case of travel or other problems
- Ideally a link to any information on the site so attendees can get the most out of their visit.

On the Day

Make sure that everyone attending appreciates the potential risks of the site – if necessary ask them to sign that they have read and will follow any safety guidelines. Count people in and out if required and collect any fees/donations.

Ensure the exact location of the site is known in case emergency services need to be called. It may be useful to know the location of the nearest hospital with an Accident & Emergency department.

Try and obtain a plan of the site if available, especially if the visit is unescorted. Given all your preparation, this should make it much easier to enjoy the visit yourself!

In the unlikely event of an incident occurring, especially anything involving injury, there is a form for recording incidents and accidents on the Sub Brit website at www.subbrit.org.uk/docs/accident-form.pdf .

Record the Site

If attendee numbers are limited or if the site is under threat, try to record the site details. As well as photographs, this could include dimensions and details of any remaining artefacts. If no plan or map is currently available, then this would be a good thing to sketch out.

For sites that have not previously been written up, please try to write an article (or get a volunteer to write it) for *Subterranea* or our website. This doesn't have to be finely polished as we have sub-editors and proof readers to knock things into shape. Submit a selection of photos if possible.

Thank you

After the visit is over, ensure that the owner(s) or other organisers are thanked profusely. Offer copies of any photos to the owner and send them a copy of any written record or notes.

Finally, if in doubt or wanting to check your thinking, email info@subbrit.org.uk and a Committee member will always try and help you along the way. **Good luck!**

Redhill sand cave (photo right). The sandstone was, when freshly deposited on the sea floor over a hundred million years ago, coloured green by grains of glauconite, a potassium iron alumino-silicate. The glauconite has been hydrolysed and oxidised to more or less hydrated yellow — orange — brown iron oxide (chemically much the same as rust) which has coloured the otherwise white silica sand. Whilst still present as a soluble iron compound it has been concentrated in the coloured bands seen in the cave walls and ceiling. The cave diminished from comfortable walking height to a very small tunnel at the inner end about a foot in diameter, from which the stream issued. The scale stick is two feet in length.

The largest room in the Southall Borough Control is the operations room seen here strewn with rotting furniture after the water was pumped out. Photo Nick Catford

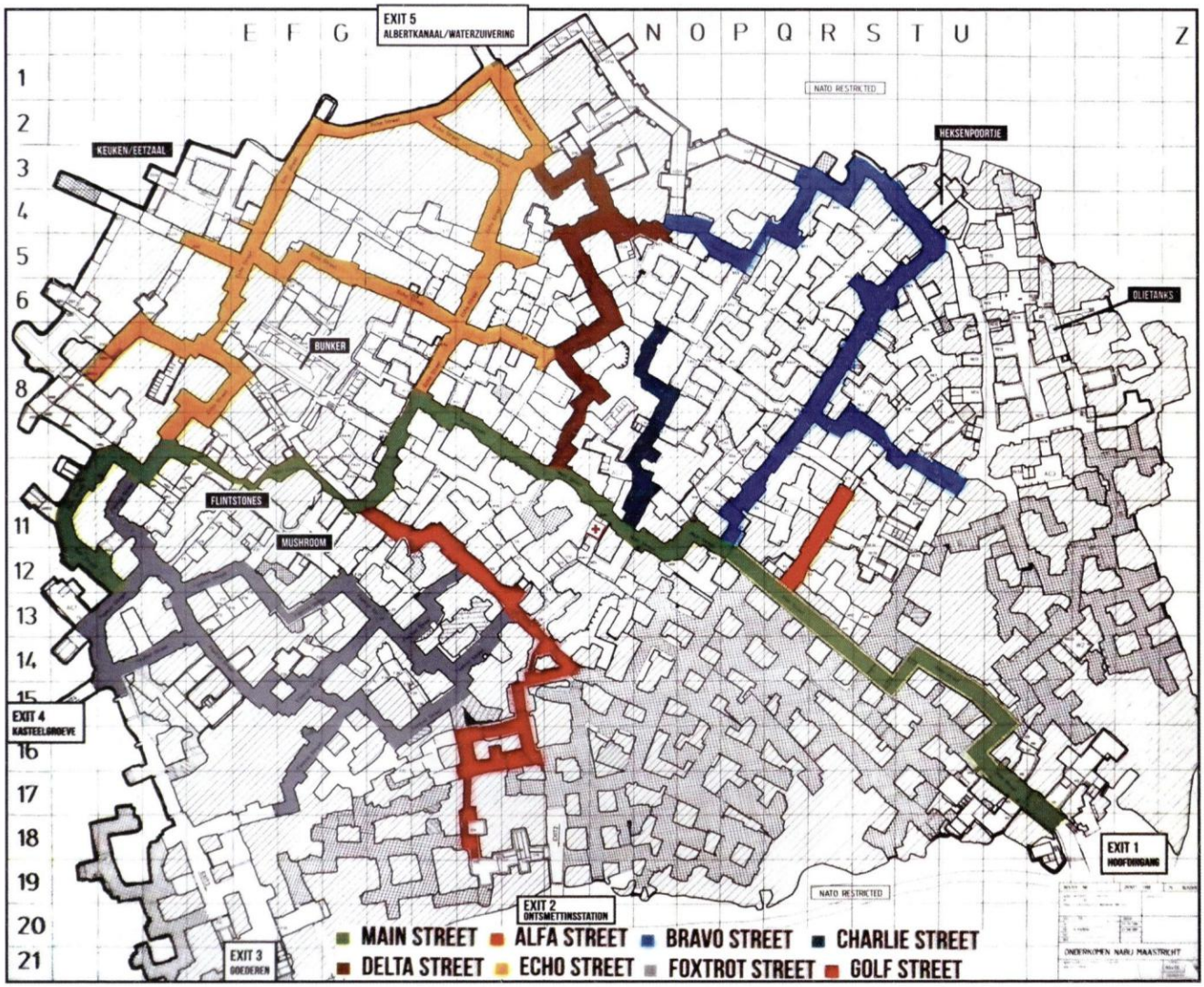
Redhill sand cave. (See news item on page 16). Caves of this kind form and collapse from time to time, so are short-lived. The entire sand pits site has been landfilled and redeveloped since this photograph was taken in 1988. Photo Nick Catford

Bleak exterior of Hope Cove GCI ROTOR radar station and RGHQ, ventilation grill visible in the near corner.
Photo Nick Catford

Looking north from the lower deck close to the bottom of the Clapham Road shaft.
Steps to the upper deck are through the door. Photo Nick Catford

The flooded stope at Hawkmoor mine seen during the 2013 Devon study weekend. Photo Dom Jackson

Gun Operations Room 4 in the bottom of the lift shaft at Brompton Road Station. An original map showing South London anti-aircraft defences is seen in the blocked opening onto the lower lift landing. Photo Nick Catford



Plan of the NATO Joint Operations Centre at Kanne

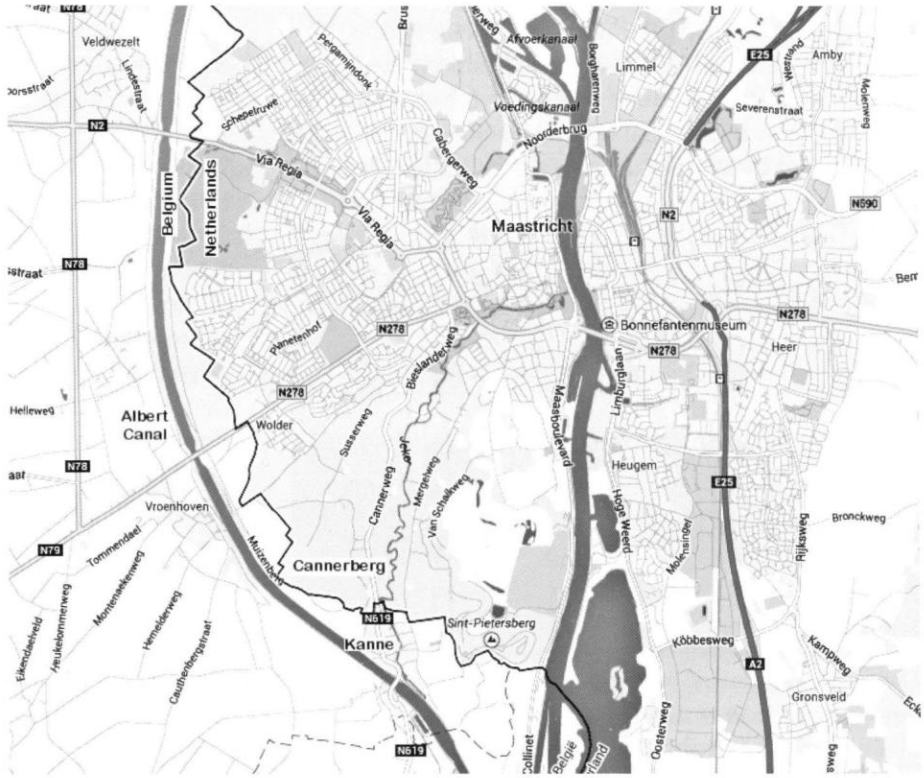
Kanne JOC medical centre in 1992. Photo Joep Orbons

Kanne JOC fire engine in 1992. Photo Joep Orbons

Secret Underground City: NATO Joint Operations Centre, Kanne, Belgium

Nick Catford, Joep Orbons, Bob Hankinson & Alan Francis

The village of Kanne lies on the border between Belgium and the Netherlands a few miles from the city of Maastricht in the Dutch province of South Limburg. It is situated in the valley of the river Jeker (a tributary of the Meuse) between Cannerberg in the west and Mount Saint Peter in the east. The village is also situated on the Albert Canal, at the western end of the canal's passage through Mount Saint Peter and the Cannerberg.



Kanne is first mentioned in a document in AD965 and in many old documents it is referred to as Canne. The village gave its name to Cannerberg, a hill to the west (*berg* means hill). In reality Cannerberg is not a hill in its own right but is part of the Hesbaye plateau, a long narrow body of limestone running north-south. The limestone outcrop is exposed mainly on the west side of the Jeker valley. The northern end is in the Netherlands with the southern end in Belgium.

Cannerberg quarries

The whole hill has been worked for building stone for many centuries. Maastricht was an important Roman settlement (Mosae Trajectum) and garrison and an early industrial centre. The Romans built a bridge over the Meuse in the 1st century AD during the reign of Augustus Caesar. The Romans did quarry limestone in very small quantities. Occasionally half a block of local limestone is found in a roman foundation or water well. 99.9% of Roman building stone in the Maastricht region is not-local and has been brought in from elsewhere.

Although Roman quarrying did take place it was almost certainly only opencast. Not a single Roman quarry has ever been identified. Underground quarrying was certainly taking place from medieval times with many of the quarries coalescing to create an extensive network of underground galleries. All quarrying had stopped by the late nineteenth century in the Cannerberg.

The main network of quarries were known by a number of different names: Boschberg, Fallenberg, Grooteberg, Jezuietenberg, Kasteelgroeve, Muizenberg and many others. Some of the quarry entrances were in the Netherlands, while others were in Belgium. There are also a number of smaller quarries that did not connect with the main system.

When the quarries were first excavated they were entirely within the Netherlands. Following the Belgian Revolution in 1830, Belgium seceded from the Netherlands but the splitting of Dutch and Belgian Limburg wasn't completed until 1839, leaving the quarries straddling the border.

In 1930 construction work started on the 80½ mile Albert Canal (named after Belgian King Albert 1) which linked Antwerp and Liege, and also the Meuse River with the Scheldt River. The 11-ft-deep canal ran through the Cannerberg hill in a deep cutting on the Belgian side of the border. The canal cut through some of the abandoned quarry galleries creating a row of new entrances in the side of the cutting.

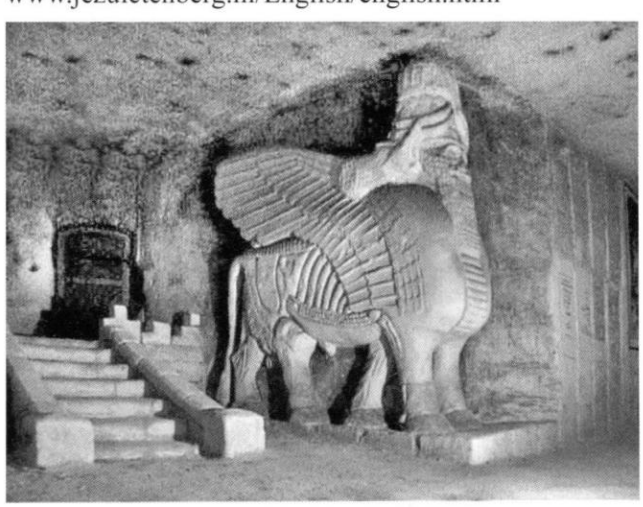
The canal goes much deeper than the usable layer of limestone for building-blocks so these entrances now sit high up the cutting, up to 15 metres above the water level. With the newly exposed limestone, some quarries were then started alongside the canal. These were mainly for loose chalk; not building stone as that low-lying stratum of limestone is not suitable for building.

The canal took nine years to complete. The German construction company Hochtief AG worked on the canal between 1930 and 1934, but then it was completed by Belgian companies. The Albert Canal was used for the first time in 1940, but because of the war, intensive use didn't start until 1946. The canal was widened in the 1980s and it now plays a very important role in the Belgian economy.

After closure of the quarries, there were some major roof falls dividing the quarry into several independent areas. Some of the old quarry galleries were put to new uses although most of the galleries remained unused.
One part of the quarry below a seventeenth-century castle called Chateau Neercanne was used for storage. The chateau is now a restaurant with two banqueting halls and a wine cellar located in the underground galleries below. www.chateauhotels.nl/default.aspx?sc=5&taal=en

One of the underground banqueting halls in Chateau Neercanne

Another section was used by a farmer to store his machinery and crops. Another part (Jezuietenberg) was used by Jesuit monks for recreational purposes. Between 1860 and 1960 Jesuit scholars and theological students spent much of their leisure time in the quarry where they created numerous painting and engravings in the soft limestone. This part of the quarry which is now designated as an ancient monument opened as a museum in 1996. 1½ hour guided tours are available for groups of 10 or more; these must be booked in advance. www.jezuietenberg.nl/English/english.html



One of the impressive Jesuit wall carvings

Germany takes over during WWII

During WWII Germany was looking for old underground quarries that could be used as protected factories. They selected a large section of disused quarry and part of the quarry that was used by the Jesuit monks. In total 25,000 square metres of quarry galleries were commandeered for making aircraft fuselages under the code name 'Sterlet'. All the entrances were in a wooded area on the west side of the Jeker valley (the eastern slope of the Cannerberg) and were not easily visible from the air. The galleries were also large enough to accommodate trains and lorries. Before work started, however, it was decided that the factory would, instead, be an end-assembly facility for V1 rockets.
Work to convert the quarry was authorised on 3 May 1944 and started in July 1944 with a workforce of 747 forced labourers. The factory was never finished; despite the camouflage the quarry was hit by American mortars at the end of August 1944. The Germans then decided to abandon the site and take their machines away. Sufficient heavy road transport to take the machines back to Germany was not available. The rail connection could not be used which meant that the larger machines had to be left in the quarry. On 13 September 1944, American forces liberated the area and at that time only eight Germans were still working at the site.
After the war the quarries came under the control of the Limburg Landscape Foundation (Stichting het Limburgs Landschap) which was founded in 1931. The Foundation is comparable to our National Trust or English Heritage. Every county of the Netherlands has a similar organisation. They now control much of Cannerberg hill and whenever a new piece of land on Cannerberg becomes available, they have the first option to buy it. They now own most of the quarry entrances. The foundation started purely as a natural history organisation but over the last twenty years, they have started to include cultural and historical sites although natural history is still their major focus.

Security gate just inside the main entrance to the JOC

The NATO Joint Operations Centre is built

In the early 1950s the NATO high command for the area between Hamburg and Kassel was looking for a suitable site to establish a primary war headquarters close to the German-Dutch-Belgian border. As part of the former Boschberg quarry at Kanne, located behind Château Neercanne, south of Maastricht, had already been converted for use as a factory by the Germans, this was selected as the most suitable location for a Joint Operations Centre (JOC). The floor of the quarry had

already been hardened with concrete and electric lighting had been installed.

On 15 April 1954 the Dutch War Department leased the quarry from the Limburg Landscape Foundation for a period of fifty years. The agreement stipulated that at the end of the lease period the quarry should be handed back to the Foundation in the same state as it was in 1954. Construction started that year to convert the quarry into an imposing military stronghold under the code name 4/371. The work wasn't completed until 1962 although there was some limited use of the new facility from 1960. In 1955 the quarry was designated by NATO as an 'interim war headquarters' to be used only in war. As of 17 February 1956 the headquarters was given the status of 'state secret' and by Royal Decree was placed under the Law on State Secrets.

One of the three Man diesel generators used to provide backup power if the national grid failed

The tunnels were kept at a constant temperature of 18 degrees centigrade. The major corridors were given names. Main Street ran through the centre of the complex. Other corridors were named after letters in the NATO alphabet in a clockwise direction from Alpha Street to Gold Street. There were five entrances (see the plan on page 42):

No 1: Main Entrance

No 2: Entrance with a decontamination station to be used after an NBC attack.

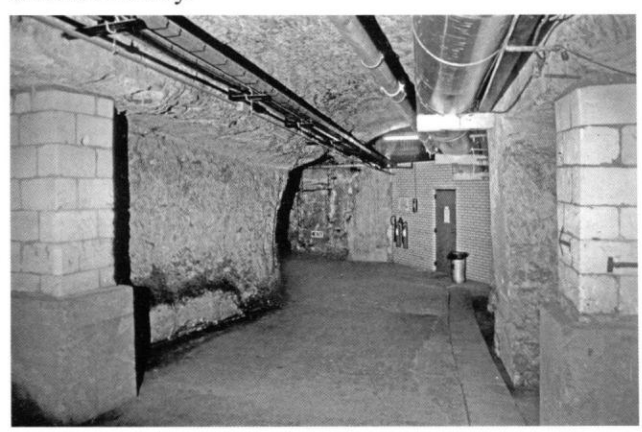
No 3: Goods entrance

No 4: Emergency escape route through the Kasteelgroeve quarry

No 5: Emergency escape route. There was a water purification plant at this entrance with water being extracted from the Albert Canal.

The Joint Operations Centre was a maze of galleries. The walls were left as they were originally quarried with no lining. The quarry looked much as it always had but ever so often one of the side galleries would be walled off to create the various new rooms that were required. It was an old quarry with military 'boxes' widely spaced throughout the facility. If you opened a door to one of these 'boxes', you would find yourself in a fully functional office, operations-room, fitness centre, bar, etc. There was one major giveaway, which were all the pipes and cables running close to the ceiling of the quarry to connect the various rooms.

.A normal quarry is very moist with a very high humidity. The air-conditioning inside the system took this water out and heated it. This meant that the walls were dried out and crumbly. All the old pre-military inscriptions and markings were lost due to the air-conditioning. It was estimated that about 1 inch of the wall crumbled/ eroded this way.



Most of the walls in the JOC were left as originally quarried with side galleries bricked up to create new rooms with pipes and cables suspended from the ceiling throughout the complex. Photo Joep Orbons

Secret underground city

The complex was on average 50 metres below ground covering an area of approximately 6750 acres with eight miles of corridors, 400 branches and 399 individual offices. The facility boasted 51 toilets, 31 urinals, 27 showers and 75 hand basins, and 4482 fluorescent lamps; it had an independent water supply. There was a fire station and two canteens; the kitchen of the self-service canteen had a capacity of 600 meals. The hairdresser was always kept busy as short hair was required for all personnel.

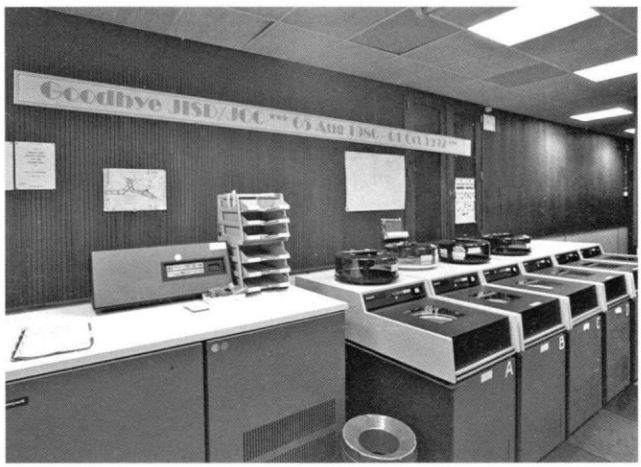
In wartime people would have to 'live in' so the bunker was provided with two bars: the 'Flintstones' and the 'Mushroom', but these were not open during exercises. There was even a 3-hole golf course complete with artificial turf. Civilians known as 'trolley dots' with a small electric trolley took care of the logistics in the tunnels. The bunker also had its own wine cellar.

Three Man diesel generators (one of which was kept as a reserve) provided back-up power in the event of the failure of the national grid. These could, if necessary, supply all the power for the bunker for up to eight weeks. There were nine underground fuel tanks with 200,000 litres of fuel available.

From 1 July 1963 the bunker was permanently manned. From that moment between 250 and 400 Dutch, Belgian, German, British, Canadian and American troops were active during the day. This was reduced to about forty people at night. During exercises it is claimed this number could reach one thousand personnel.

Should war break out, the regional headquarters of

the 2nd Allied Tactical Air Force (2ATAF) could be immediately relocated here from the Joint Headquarters Rheindahlen, a military base in Mönchengladbach in West Germany where it was housed in peacetime. Allied Tactical Operations Centre (ATOC) was also present in the complex. This organisation would, if necessary, on behalf of 2ATAF give commands to the Allied attack aircraft.



The Computer Centre seen on the day the JOC closed.
Note the banner on the wall.
Goodbye JISD/JOC 05 Aug 1980 - 01 Oct 1992

In addition the bunker would also house the command of the Northern Army Group (NORTHAG). This command covered the Dutch, British, Belgian, German and possibly U.S. Army units in northern West Germany. In event of war, the Joint Operations Centre would connect with forward command posts and their units via the communication system of the NATO Air Defence Ground Environment (NADGE).

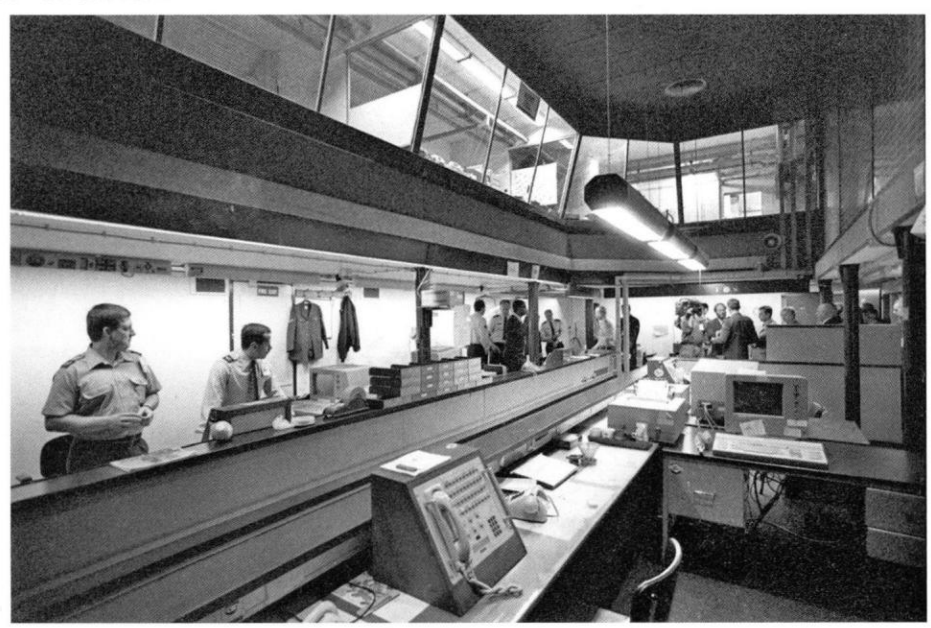
The facility was equipped with hi-tech state-of-the-art code and crypto communications equipment located in the Air Defence Operations Centre, the Tape Relay Center and the Crypto Center. These housed several important offensive computer systems like 'Eifel' (Einsatz Fuehrungs System Luftwaffe) and 'Scars' (Status Control Alerting and Reporting System) to connect and to control all NATO bases throughout Europe.

Nothing ever came out

In the early years, in an attempt not to arouse local suspicions about the function of the facility, all personnel working there wore civilian clothes in the 'Caves', as they were generally known. They also adhered to a strict rule: apart from people, anything that went in never came out. All waste material ranging from redundant furniture to food waste was dumped in one of the sixteen underground landfill sites. Old documents were sent to the shredding room (B14). Once shredded, the paper strips were then further ground into pulp for security reasons as there was a permanent fear of espionage. The Russians apparently had good contacts in Limburg as the Soviet political newspaper *Pravda* would regularly announce in advance that exercises were being held at the facility.

There were rumours and speculation that there were nuclear weapons stored underground at Cannerberg and it wasn't until 1963 that NATO publicly confirmed that the site was a communications centre. It remained a 'forbidden place' under the Protection of State Secrets Act which forbade people to even talk about it. Even as late as November 1980 an edition of the magazine *Vox* (the Belgian armed forces magazine) reported a secret underground NATO Headquarters 'somewhere in the region of Maastricht'.

At the entrance to the facility there was a poster with portraits of eleven soldiers from the Russian Soxmis mission who were seen as a threat. The military liaison missions arose from reciprocal agreements formed between the Western allied nations (the US, the UK and France) and the USSR shortly after the end of the Second World War. The missions were active from 1946 until 1990.

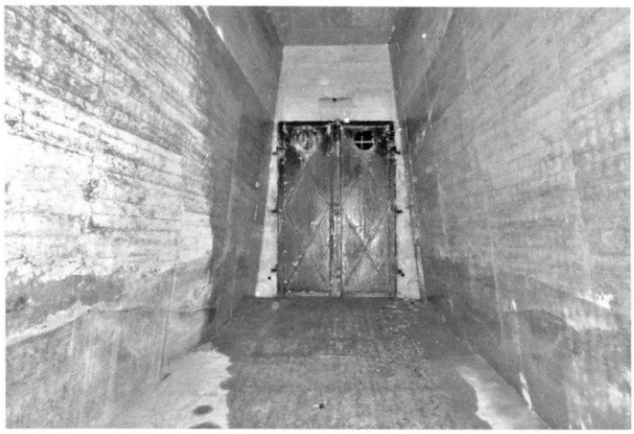


The two-level air operations centre

The agreements between the allied nations and the Soviet Union permitted the deployment of small numbers of military intelligence personnel – together with associated support staff – in each other's territory in Germany, ostensibly for the purposes of monitoring and furthering better relationships between the Soviet and Western occupation forces.

Alan Francis recalls his time in the bunker 1964 – 1968

In 1964 my last posting in the Royal Signals came up. I was posted to a signal troop in the Joint Operations Centre in Belgium, near Maastricht. I will not go through the shenanigans of how I got there, arriving first in Germany by plane and then transit troops not knowing where I was



One of the emergency exits. Photo Joep Orbons

supposed to go. Anyway I finally found my way there. At the gate I was not allowed in (no NATO clearance), so I was taken to my living accommodation. This turned out to be a Belgian national service barracks called Ambeorix Caserne in the town of Tongeren. When I got my pass, I joined a bus load of Canadians, Dutch, Belgians and a sprinkling of British RAF and army guys on the morning trip to the 'Caves', as they were generally known.

We drove for thirty minutes to Maastricht and then on towards the Belgian border at Kanne. The bus stopped at the bottom of a narrow lane leading up to a large wooded hill. I followed the crowd up the lane and as we got near the top I saw a large closed gate in the cliff face. A small picket gate was open. I stepped through to be amazed.

Beyond the gate was a security fence where our passes were checked near a guard room on the left. We entered a thirty-foot-high concrete corridor, wide enough for army Land Rovers and lorries to drive in. We walked along the corridor for about 200 yards and at its end there were the tunnels of a stone quarry branching off to left and right. I was directed to the right and walked down a tunnel with walls and doors set into the rock. My destination was System Control.

There we controlled and monitored and maintained all the voice and telegraph circuits coming into the cave. Right next door was a Dutch PTT repeater station with whom we worked very closely. I was taken on an acclimatisation tour, walking through dark corridors to be shown canteens, medical centre, main switchboards, and showers. There were also all the command centres required for the staff of the Northern Army Group and the Second Tactical Air Force to fight a war.

One of the first things I was shown was a large stone set into the wall of a tunnel, which they told me was where a witch had been walled up. Quite a large inscription carved in the wall told us about this act. The most important parts of the tour were the escape tunnels, one going out to the banks of the Albert Canal in Belgium, and one which came out in a farmer's potato store in the village of Kanne.

Secret night-time excursions

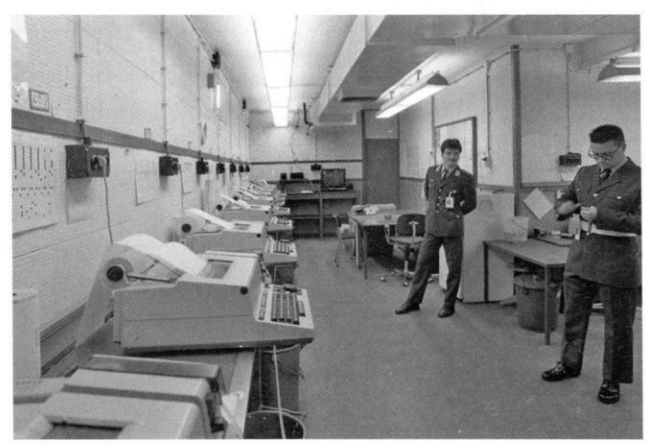
Although an important place, outside of major exercises it was quiet. The whole place was kept ticking over by being used as a tape relay centre passing messages between all the NATO countries. I have known times (no names no pack drill) when people on night shift were allowed out the escape tunnels to spend a few hours in the bars of Kanne and allowed back in at a set time.

During exercises this would not be possible. Then the place came alive, full of top brass and communication personnel from all the NATO countries. It was considered atom-bomb-proof and gas-proof but one day a fire in a chip pan in the NAAFI caused the total evacuation of the bunker. During my four years there, if I was on day shift in the winter months I would never see daylight, going in whilst it was dark and coming out in the dark. We all suffered a bit with our eyes as a constant fine drizzle of dust fell from the tunnel walls and roofs.

Within the complex of caves, nearby there was a monastery. We would go to midnight mass at Christmas. In some ways it was a good posting: very little of the army bull, and the local bars were open all day long. However, we were very far from any support like stores and replacement uniforms.

We were often too busy to eat during our shifts. If I did have spare time, I would wander through the dark tunnels where there were very few lights on at night, thinking how strange it was to be working in a Roman stone quarry.

To speed transmission, all signals were typed into a teletype and punch paper tape was produced. That would then be put on line and sent fast. Each sending station would be for a single line to the next relay centre, and they would send on to other destinations according to the published routings. Some comcens worked only as end points, others as relays, some as both using encrypted lines. Note the waste bin bedside each teletype (teleprinter). The bins were strictly for used PPT. The PPT would be kept in case it had to be sent again. (PPT is punched or perforated paper tape).

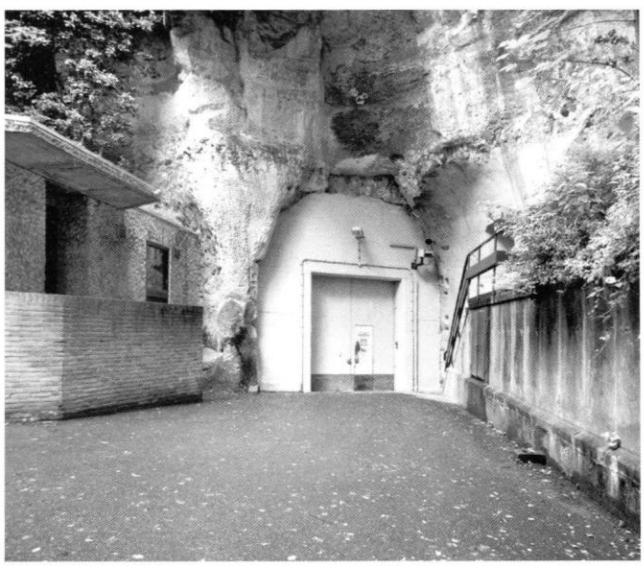


The comcen on 1 October 1992. The man on the right is wearing RAF dress uniform (hence the white belt); the other man is probably Dutch indicating it's a multi-national comcen.

As security was tight no paperwork ever left the caves: it was all shredded and mixed up with water and other things and used to insulate the walls. At the end of my stint there, I was glad to leave, and not even the Belgian and Dutch 'kermis, carnival and Rose of Montag' celebrations were enough to tempt me to stay.

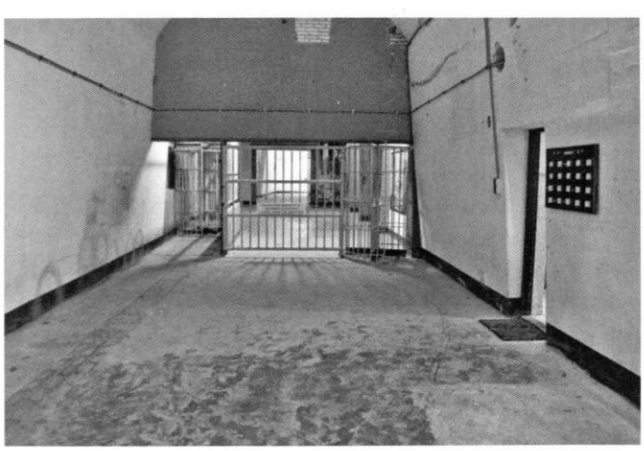
Bob Hankinson recalls his time in the bunker from 1980–1983

The JOC Joint Operations Center at Kanne had a wartime role as the Alternate War Headquarters for NATO 2nd Allied Tactical Air Force (2ATAF). I was a staff officer in the headquarters of Royal Air Force Germany, which was a major component of 2ATAF – the Commander in Chief RAF Germany also had the multinational NATO role of Commander 2ATAF. We shared a peacetime headquarters building in the Joint Headquarters site outside the village of Rheindahlen, not too far from Dusseldorf and close to the football town of Mönchengladbach.



The main entrance opens onto Main Street. Photo Nick Catford

I had a wartime role in the Static War Headquarters in a national liaison team. We were three officers and two communications folks. We occupied the office of the senior British Officer who worked all the time in the 'Caves' and had a wartime role that kept him in the ops centre. We basically had a desk and two chairs, and a side room where the comms people operated our signals centre (like telex but wholly within military lines). On the map we were at square D10, on 'Main Street' just past the 'Flintstones' bar (which was not open on exercises). Main Street became very narrow because our comms room was built into the main corridor.



Looking out of the tunnels towards the security gate. Photo by Michael Grube

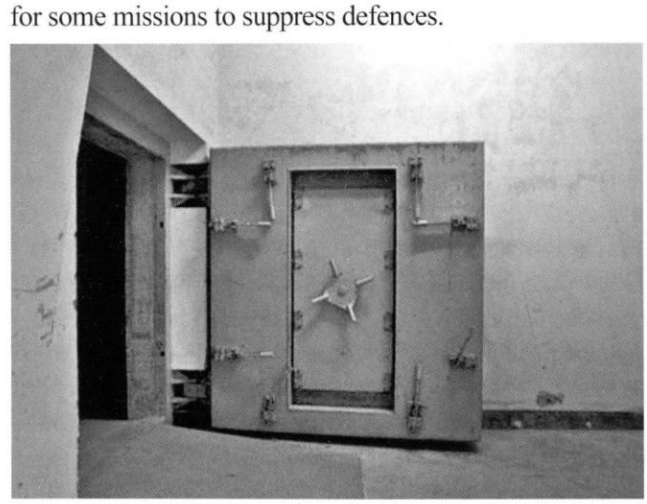
We operated two 12-hour shifts during exercise periods, in February and October. Though we lived in hotels in Maastricht for exercises each spring and autumn, in real periods of tension we would have slept inside when off shift. I was on the day shift, starting at 7am. We were an independent team so we had our own vehicle – most of the rest were brought by bus. We would get to the entrance about 06:30 so that we could park, walk up to the door, swap our badges and walk through the corridors to our office and do a handover so that we were ready by 7am. The night shift of one officer and one signaller would leave and take our vehicle.

This was just for our team – there were many other teams and probably 250 staff in the caves on the day shift. I have seen estimates of 1,000 but it did not seem that crowded, judging by the number of rooms and the number at lunch. I don't recall an army presence, but they may have been in the Eastern side with shift change being made at a different time – or maybe they did not 'play' at the same time.

After hearing from the off-going night shift their view of the highlights of the night and the actions needed or follow-up needed, we would read the night log and the night signals (telexes) relating to the work of our cell and the general war situation and air force situation. Then one officer would go to breakfast while the other officer called the day shift at the primary war headquarters and confirmed that their understanding was the same as ours.

International cooperation

Next was the operations briefing. The operations staff would have worked through the night, assessing mission reports from missions flown the previous day and during the night, and reviewing any intelligence reports. From that and the general tasking from the Supreme Allied Commander Europe (SACEUR), the tasking staff would have selected targets to strike during the day, and would have issued the tasking orders to the German, British, Dutch and Belgian airbases, and the US air base that provided specialist support for some missions to suppress defences.



Internal blast door close to the main entrance. Photo Michael Grube

The majority of US air forces in Europe were in 4ATAF, which had a US commander whereas the 2ATAF

commander was always British. The early tasks would have been launched from the airbases in the dark usually, to have a time on target around dawn (half an hour before sunrise). So the day-shift operations briefing was more about the ops for the next 12 hours.

First off on the ops briefing was the weather report. Weather still plays a major part in military operations, because true all-weather capability is limited, then and even now. Next would be intelligence, then ops and then logistics. Intelligence would include briefings on the general war situation as well as any damage reports and the progress of the land battles. Ops would include the status of our own airfields and facilities, and any that had suffered enemy or sabotage damage in the night.

There was also a political briefing, which generally talked of civilian protests or support on both sides of the war. The ops briefing would have the commander and his key deputies (who would tend to be from the other air forces), and the ops staff were integrated with positions filled by officers in different air forces. I would usually attend the ops briefing and bring back a synopsis of key points relating to our role. Frequently there would be a need to go to meet with the national liaison teams of other nations in the caves, to ask for or offer help.

Lunch and supper would also be taken in the caves; the canteens served hot food, and I think we paid cash in Dutch currency. I am sure that in a real war the food would have been heated 'composite rations' rather than fresh food freshly cooked, but during exercises it was fairly good.

Regular exercise

If it was a two-week exercise we would do a swing day when the night and day shifts would swap, so I did night shifts as well. The atmosphere was very different at night. There were fewer people in the caves, and they were working on long-term tasks like deciding what the air strikes for the next day should be and writing the tasking orders. Those folks worked in the Air Defence Operations Centre; a dimly lit large two-level room with a closed-in balcony (F8) that included the illuminated transparent totes. Some would list all the airbases, others all the squadrons and others the taskings.

They were maintained by airmen who would write on the back of the glass screens in backwards handwriting (block letters). The glass screens were illuminated from below up the edge of the glass, so the effect was that the screen glowed only where the lettering was added with wax pencil. The backwards writers could update the boards without blocking the view of the ops officers that needed to see the information. The ops officers were viewing the status of perhaps 50 airfields and 100 squadrons and their tasking. As the war situation progressed, they would be assessing whether a squadron had the capability to mount a sortie, whether their base was capable of launching them with weapons and fuel etc.

On night shift there was more time for wandering. The caves were a real maze, since they had been created through underground limestone quarrying by the pillar and stall method, just like Burlington in the UK. Roof collapses were likely if the quarrymen made the pillars too small, or the stalls too wide or long or the roof too high. Most corners were roughly 90 degrees, but only roughly. Going through the caves was an exercise in left and right turns every 50 feet or so. Navigation was helped by street names. Unlike in the USA, where streets are numbered on a sort of grid pattern, these were zigzag streets. My office was on Main Street and J Street, so if I got lost I would just keep walking until I came to either main or J, and join it. If I went the wrong way, eventually the street would peter out either at the perimeter or a T-junction, and you would just turn round and go back the other way.

Echo Street. Photo Joep Orbons

We all carried battery powered torches, though 'cyalume' glowsticks were used instead later on. I tried to walk every branch of the streets and my job was liaison with other nations, so I could go to the joint areas and the single-nation areas. I could have done a much more thorough job if I had a copy of the map that is available now on the internet.

It was never cold. We all wore combat kit and boots and carried respirators when the situation demanded. The respirators were for protection against gas or nerve agent, not asbestos. I would always be in a short-sleeved shirt, which I found comfortable when walking around – and my job required a lot of walking around. Nor did it feel damp at all. It was cool.

I never saw any bats or rats. Or Spetznaz. Or Soxmis.

The 'corridors' were between 10 and 15 feet wide. At the front entrance, the first section had concrete-lined walls, done by the Germans in WWII. Elsewhere, everything was natural stone. Very few areas had brick reinforcement, though offices were created with brick walls.

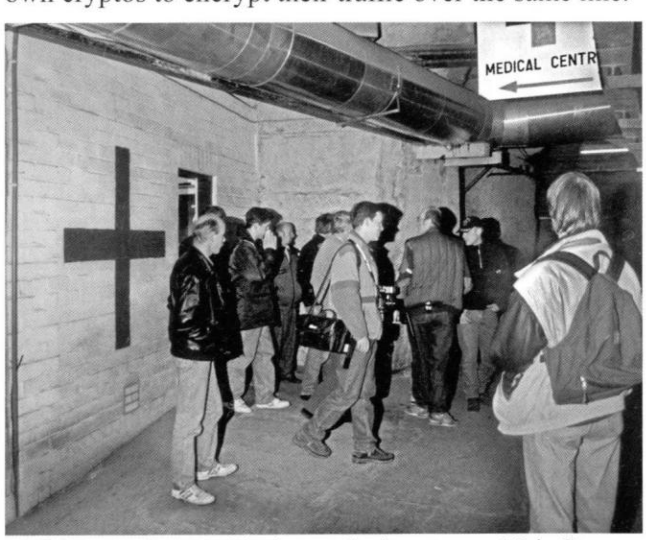
Air Defence bicycle

The Air Defence Operations Centre was wider and longer than the norm for an unsupported roof, so I assume that it had girder or concrete reinforcement. The only vehicles were one bike and a couple of electric carts, one for goods and one as the fire engine. The bike was used by the Dutch soldiers who delivered the telexes from the

main Communications Centre. You would hear the bike bell ringing and beware of blind corners.

Since we had our own dedicated comcen, we got very little from the main comcen with two teletypes and a rack of cryptos. I used to be the crypto custodian, and would issue the crypto settings for the day which the comms guys would program into the key unit (by moving jumper wires). Then at the daily changeover time, they would remove the physical unit and slot in the next one, unplug the jumpers and hand back the old crypto setting sheets to me. I had to deliver them back at the end of the deployment to the headquarters crypto custodian. One time, the soldier delivered a telex message to us that wasn't intended for us, though I knew where the door was to the team for whom it was destined. So I walked round there, and knocked. The door opened and someone asked suspiciously what I wanted (since my badge did not have the letter for that area). I asked if this was the _____ team. But he wouldn't tell me, though we both knew, since we were both Brits and I was aware of their role. So I asked if I should keep the 'SECRET' telex, and he grinned and agreed to take it.

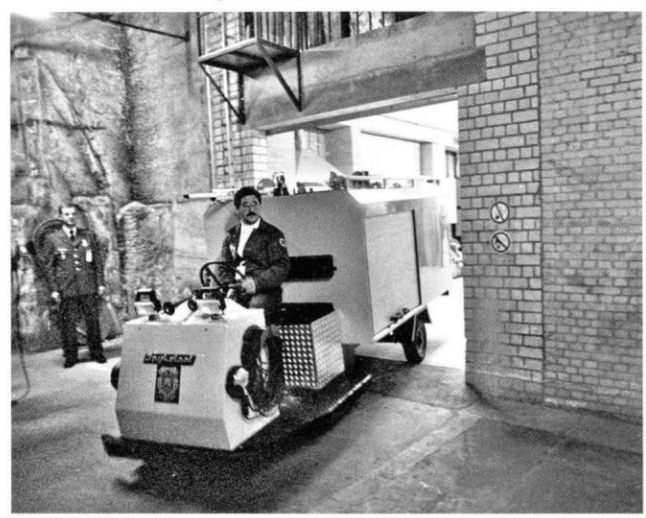
One year the US sent a one-man national liaison team as a trial. I was fascinated that he had his own system - an Osborne micro (the sort that was about the size of a suitcase and had a keyboard that acted as the lid). He could type his own signals, and had a punch code printer so he could produce his own 5-unit tape and hand it in to the joint comcen with a cover sheet that just had the addressees on it. The comcen would then punch up the addresses on another bit of tape, and transmit that on the line followed by the tape that the US guy had already produced. It would then have been double encrypted. High security teams would work a bit differently - they would be given control of a line for a period and use their own cryptos to encrypt their traffic over the same line.



Visitors gather outside the medical centre on Main Street shortly before closure of the base in 1992.

Photo Joep Orbons

I made friends with the firemen and they took me on their scheduled walking fire-prevention tours. There was not much to burn, except desks and paper, but the effects of a fire underground could rapidly turn deadly so there was considerable attention paid to fire prevention. The firemen took me out of the fire exits one time (Exit 4, facing west into Belgium). We went to a perimeter door, unlocked it and went through into other parts of the 'caves' that had not been developed (and are not shown on the plan). The floor was sand, but the walls were very similar. We weaved through the passages and stopped at a place where there were wall carvings, made by hippies in the early 70s, I was told. Then we ended up at the doorway in Belgium, where the local farmer had stored some of his farm machinery. Going in on the Dutch side, and travelling underground into Belgium. Even at this stage of the development of the EU, there were no explicit border controls any more, even on the roads.



One of the electric vehicles for moving goods around.

The front entrance had a very unusual feature that answered a strange rule. When I arrived in Germany, my predecessor told me there was a very strict limit on the number of ID badges that were issued for the caves. If your war duty was at the caves, two badges were made. One was for your peacetime duty and served to get you access to the huge office complex that was the peacetime Joint Headquarters – the other badge went to the caves. When you went in, you swapped your peace badge for your caves badge. They were worn on a chain around your neck. You would hand over your peace badge, and a Dutch soldier would find your war badge in a large board that had about 250 slots. Your peace badge would go in the slot to replace your war badge. This also served as the basis for an emergency tally of who was in and who was out. And the reason why caves badges were so strictly limited? The badge holder had only enough slots for the number of people expected to work there! That's another reason why I don't think the number of staff was 1,000.

Firemen make hasty exit

One time, the firemen took me to see where a new emergency exit was being developed. Basically, the limestone was so soft that the workers used a chainsaw to cut it. They had got through the rock with a square section corridor, and

had reached the earthen overburden. They were installing security gates before they broke through the earth to make the new exit connect with outside.

I recall that one of my female colleagues had a respiratory illness that was supposedly linked to spores inhaled in the caves. I later heard that the caves were badly contaminated by asbestos, but I suspect that it was a case of higher standards being enforced than any real change from the time I was there. I spent three years in the role, from 1980 to 1983.

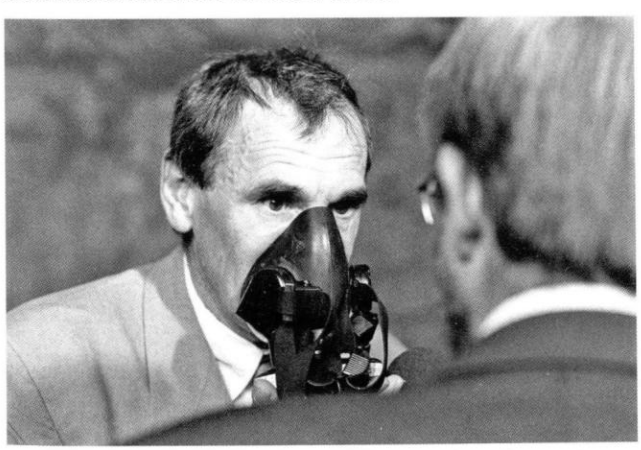
There is an article in Wikipedia about Exercise Able Archer 83, the Autumn regular CPX Command Post Exercise. http://en.wikipedia.org/wiki/Able_Archer_83

Wikipedia says that the Warsaw Pact (WP) were so alarmed by AA83 that they thought it might be secret preparation for an actual war. I can recall being in Able Archer in probably 1980, 1981 and 1982. I think it would have become obvious if the exercise had been a prelude to a real invasion. I also have considerable doubt that NATO personnel would have gone along with it.

The early stages of exercise painted scenarios that accelerated through days and weeks of reports of increasing tensions. Without the reality of seeing those tensions in the media before deploying to the wartime positions, the duplicitous scenario would have had to say that it was a coincidence that all of NATO had gone to an exercise war footing and coincidentally the WP had attacked. To have provoked the WP with an exercise, and waited till they mobilised to attack for real would have been a Kafka-esque gamble.

Asbestos contamination forces premature closure

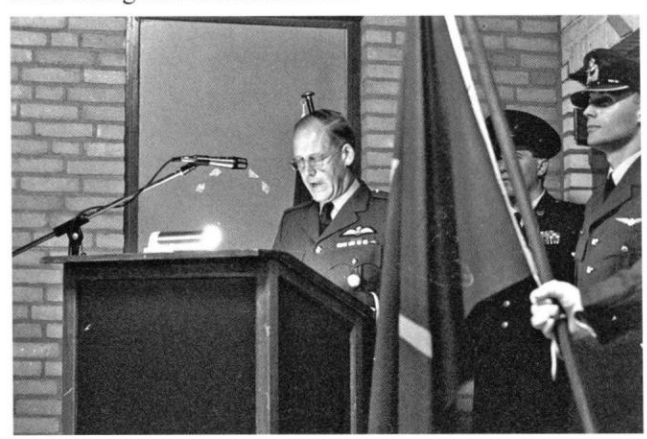
The fear of asbestos contamination eventually meant the end of the NATO base. Over the years a number of military personnel and civilian employees have become ill due to the high level of asbestos fibres in the air. Despite these warnings, the Dutch Ministry of Defence and NATO failed to tackle this dangerous pollution, despite calls from military authorities of NATO member states.



In later years in certain areas of the complex, the workers had to wear face masks due to high concentrations of asbestos in the air

The worst asbestos contamination originated after a fire in one of the kitchens in 1968 – the jute cloth and insulating cork layer to the air ducts caught fire resulting in a huge amount of toxic smoke being released into the narrow galleries. The fire spread through a large part of the system because of the pipes and cables connecting all the individual rooms. To stop this happening again all the cables and pipes were sprayed with asbestos-concrete to prevent a future fire spreading. After the fire, it was many years before the asbestos contamination was fully recognised although in 1976 the RAF advised all equipment personnel to wear protective masks.

The threat of asbestos contamination had worried personnel in the centre for many years and a headstone on a wall in Alpha passage has an inscription in English 'in peace my health killed by cave'; this can still be seen. It is not known precisely how many people became ill due to the asbestos contamination but it is believed ten people who had worked in the bunker eventually died from malignant mesothelioma.



Dutch Major General Evert Westerhuis (centre) is being introduced by an unidentified senior RAF officer during the transfer of the Joint Operations Centre by two Allied Tactical Air Force to the Dutch Ministry of Defence on 1 October 1992

In 1991 the Dutch Ministry of Defence commissioned a survey to determine the full extent of the asbestos contamination. The result of the survey led to the recommendation that the bunker should be taken out of service as quickly as possible. NATO proposed relocating operations to the recently constructed Castlegate facility. Castlegate is the code name for an underground NATO bunker two km northeast of the city of Linnich in the state of North Rhine-Westphalia in Germany. The bunker complex there includes 14,000 square feet, six underground levels (up to 28 metres deep). It offers protection against conventional, biological or chemical attacks, to shock waves and electromagnetic pulses.

The plans for Castlegate date back to the early 1960s, as a 'safe castle' for NATOs Northern Army Group (NORTHAG) and Second Allied Tactical Air Force (2 ATAF) in Mönchengladbach. Construction began in 1983, with completion in 1992. The bunker is still in use as Static War Headquarters Castlegate and is operated in 'caretaker status' for Allied Joint Force Command Brunssum by a German military contingent.

Civilian employees at Kanne were given respiratory protection which they were required to wear in certain areas of the complex due to high concentrations of

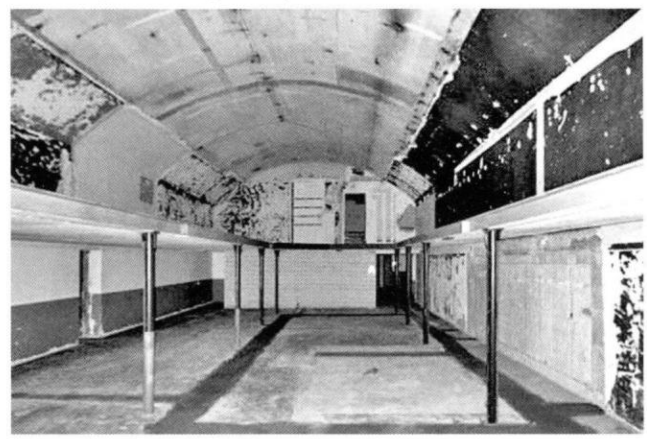
asbestos in the atmosphere. The military personnel working in the bunker remained unprotected.
Although the danger of the asbestos contamination accelerated the closure of the base, this was overtaken by international events that followed after the Berlin Wall fell in 1989. The Joint Operations Centre quickly became redundant and was deactivated on 1 October 1992, officially closing in 1995. The site was prepared for the transfer back to the owner in compliance with the conditions in the 1954 lease.

The big clean-up begins

The Defence Infrastructure Agency on behalf of the Dutch Ministry of Defence initiated one of the largest clean-up operations in Dutch history, costing $40 million and commencing in 2003. Not only did the asbestos, which had been used for fire insulation, have to be removed but investigation showed that diesel fuel from the tanks had leaked into the porous limestone over a long period and had penetrated to a depth of about forty feet into the rock. This area had to be removed and disposed of.

Joep Orbons (one of the co-authors) helping with the asbestos removal in April 2006

The tunnel had to be additionally supported in the affected area to prevent a collapse. The resulting cavity was subsequently filled with a similar mixture to the density of the limestone, to ensure the stability of the rock. Some of the galleries they had been filled with waste were unstable and had to be checked before they could be cleared. During one of these checks in 2004, a large part of the ceiling collapsed killing one man.
The asbestos removal was found to be more complicated than expected – ultimately much of it had to be scraped off the walls manually in contaminated areas. The raw discharge of domestic waste-water sludge mainly on the Belgian side of the quarry also had to be dealt with. In total 9.3 million kilos of asbestos waste was removed, 2.9 million kilos of limestone contaminated with oil, 5.1 million kilos of clean limestone and 158,000 kilos of debris. 2,500 cubic metres of waste from 14 underground landfills also had to be disposed of.
Two of the landfill sites were left as the ground was considered too unstable. The clean-up took 8 years to complete between 2003 and 2010. The final, formal completion of the clean-up took place on 24 January 2012 when, after more than 57 years, the Ministry of Defence finally abandoned the quarry, officially handing the refurbished tunnel network back to the owner, the Limburg Landscape Foundation.



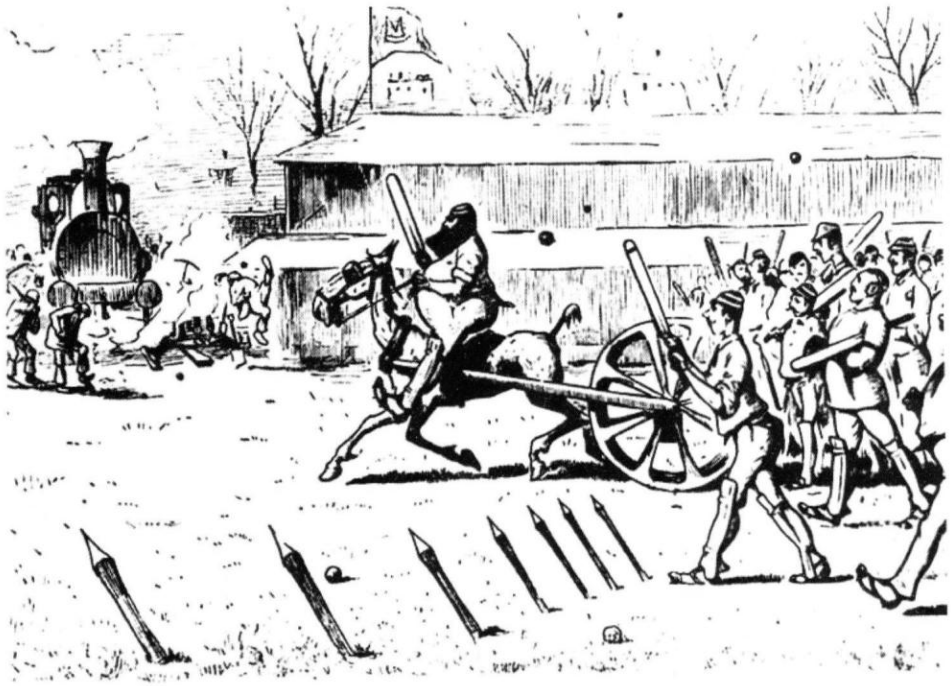
The two-level air operations room in 2014. Although stripped of almost everything the balcony still remains. Compare with the picture on page 46

Now a tourist destination

Since September 2013 the once-secret NATO JOC tunnel complex has been open to the public. Tours of two-hour duration are available for 6 Euros.
Tours run at 1400 hrs on the following weekend dates in 2014: 17/18 May, 14/15 June, 19/20 July, 16/17 August and 13/14 September. The tour guides are provided by the Limburg Landscape Foundation. Advance bookings and online payment is required: see www.limburgs-landschap.nl/item/excursies-nato-hoofdkwartier
Additional sources:
NAVO-hoofdkwartier Cannerberg (Dutch Wikipedia) http://nl.wikipedia.org/wiki/NAVO-hoofdkwartier_Cannerberg
Linberg Landscape Foundation (Dutch) web site. www.limburgs-landschap.nl/persberichten/item/schoongemaakte-cannerberg-terug-bij-stichting-het-limburgs-landschap
Ace High Journal (Dutch) https://sites.google.com/site/hmazmaastricht/home/hmaz---historie/
Maastricht online forum (Dutch) www.geschichtsspuren.de/
Web site (German) of historians Michael and Christel Grube

What Would Thomas Lord Say?

Nick Catford



LORD'S IN DANGER. THE M. C. C. GO OUT TO MEET THE ENEMY.

["Sir EDWARD WATKIN proposes to construct a Railway passing through Lord's Cricket Ground."]

Cartoon from *Punch* Magazine 13 December 1890

Lord's cricket ground in north London, the home of the Marylebone Cricket Club (MCC), is hallowed turf to cricket fans. But what few of them know is that there are three railway tunnels under the premises that have been in the news in recent years, due to various plans for their development. One of them still carries trains from Marylebone station to Birmingham, all three were sold in 1999 and plans for their use have ranged from various Lord's facilities, including their famous museum, through an underground hospital to a station allowing cricket fans direct access to the ground.

The Club's ownership of the ground only goes down 18 inches. Below that belongs to the developers who bought the tunnels, and hence a dispute that's rumbled on for many years.

London's last mainline station

Marylebone station was opened on 15 March 1899 and was the terminus of the Manchester, Sheffield and Lincolnshire Railway's new London-extension main line – the last major railway line to be built into London until High Speed 1 a few years ago.

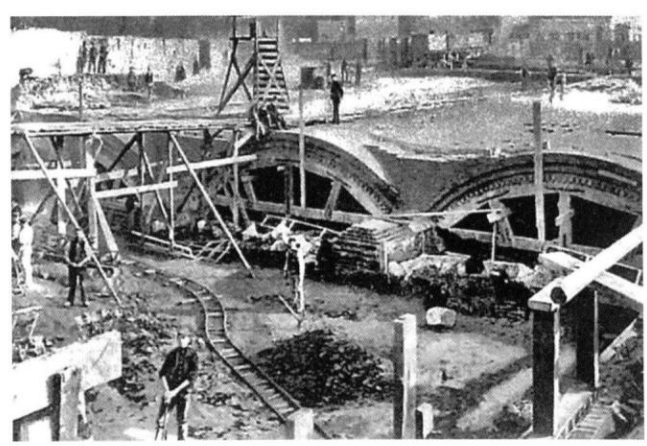
Finding a suitable location for a station at Marylebone presented a huge problem for the company. Over 37 acres of prime inner London in the only spot available, immediately to the west of Regent's Park, had to be cleared, an area that 19th-century expansion had filled with homes and businesses. To replace 507 houses 'of the labouring classes', occupied by 3,073 people, the MS&LR built Wharncliffe Gardens, six five-storey blocks off St John's Wood Road.

Marylebone was planned as an eight-platform station, but with half of the platforms designated as a 'possible future extension'. The cost of building the MS&LR was far higher than expected, nearly bankrupting the company. Thus there was never enough money for the extra platforms, and only four platforms were built, three within the train shed and one west of the train shed. As a result the concourse is unusually long and, for some fifty years, had only three walls, the northern wall being missing, since the MS&LR anticipated that the other four platforms, under an extended train shed, would be built later on.

Tunnel vision

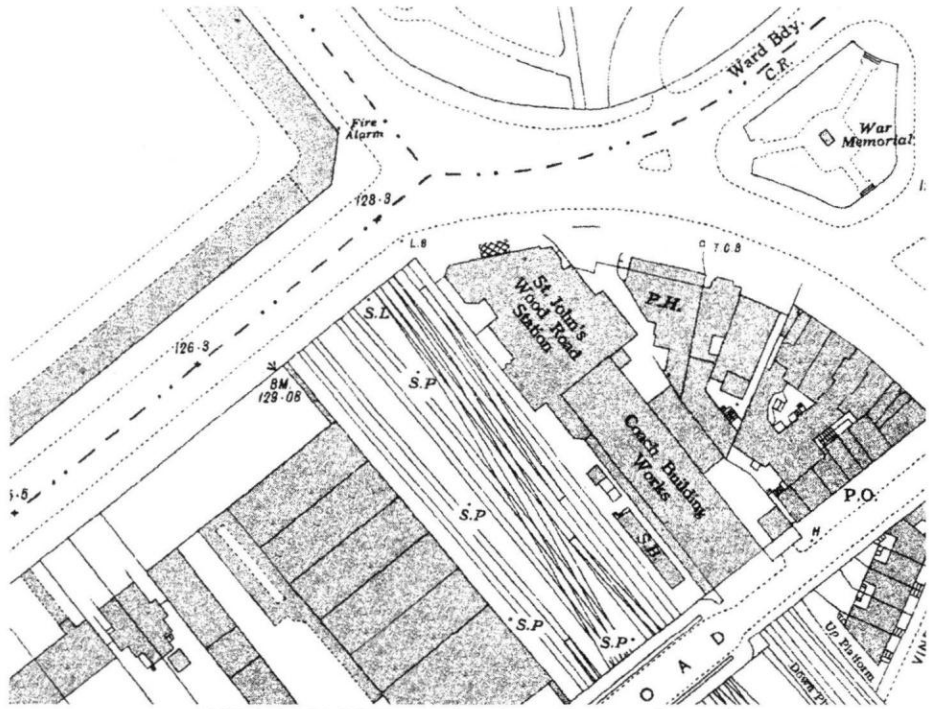
Far more controversial was the upset over Lord's famous cricket ground as the route of the line ran through the Nursery (east) end of the ground. WG Grace led the protest against the new line in person. Fearful that his Railway Bill would be rejected by Parliament, MS&LR chairman Sir Edward Watkin quickly agreed to a compromise with the line being hidden by a tunnel. To placate hostile St John's Wood inhabitants, it was agreed the work would be started and finished between one cricket season and the next. Eventually the MCC agreed as they were promised a brand-new pitch.

As it was anticipated that Marylebone's additional platforms would be built at a later date, three cut-and-cover tunnels were built at that time to avoid future disruption to Lord's. Two were double-track tunnels and the third could accommodate three tracks. The eastern



tunnel was used for the line into Marylebone but the other two were left blind at the northern end. Track was however laid into them from the south and they were used as carriage sidings.

The two photographs shows the construction work in progress. The tunnels were built by the cut-and-cover method rather than boring, and this is shown to good effect here. The wooden centrings are in place and the brick courses are being built up. The scale of the work can be judged by the group of navvies gathered in the bottom right of the picture below. When finished, the area was covered over and the new cricket pitch laid. The work was carried out by J. T. Firbank of London Bridge between 1894 and 1898.



1938 1:1,056 OS Town plan shows the tunnel mouth. The main line into Marylebone is on the right with three tracks running through the tunnel

Photo from Leicestershire County Council Records Office

The legal arrangements entered into provided an overriding lease for the Manchester, Sheffield and Lincolnshire Railway with a 150-year lease for the trustees of the MCC over the surface and subsoil to a depth of 18 inches. (The lease was renewed for a further 150 years to 2137 in 1988.) The MS&LR changed its name to the Great Central Railway (GCR) in 1897 in anticipation of the opening in 1899 of its London Extension.

Passenger traffic on the GCR was never heavy; perhaps because it was the last main line to be built, which meant it had difficulty competing against longer-established rivals (especially the Midland Railway with its terminal at St Pancras) for the lucrative intercity passenger business. Furthermore, for forty miles between Aylesbury and Rugby the line traversed thinly-populated countryside, thus attracting little passenger business at intermediate stations.

The GCR also struggled to compete with the Metropolitan Railway for second- and third-class traffic from nearby towns such as Harrow, Chesham and Aylesbury.

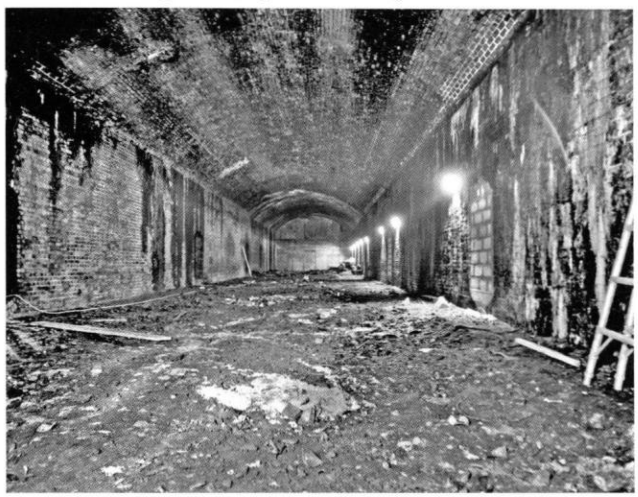
Marylebone's slow decline

The Great Central Main Line was regarded as a duplicate of the Midland Main Line, and long-distance trains from Marylebone began to be scaled back from 1958, leading to the eventual closure of the Great Central Main Line north of Aylesbury, as part of the Beeching Axe in 1966. The run-down of services began after the line was transferred from BR's Eastern Region to the London Midland Region (although Marylebone itself, and the first few miles of its route, had belonged to the Western Region since 1950). In 1958, the *Master Cutler*, the line's daily crack London-Sheffield express, was diverted to London King's Cross and thenceforth ran via the East Coast Main Line.

In 1960 all Express services were discontinued. From then until closure in 1966 only a few daily long-distance 'semi-fast' services to Nottingham remained. In 1965 freight services were curtailed. Marylebone's large goods yard was closed and sold to the Greater London Council (GLC) for housing.

Following the removal of long-distance services, Marylebone was reduced to serving as the terminus for local services to Aylesbury and High Wycombe only, with some services extended to Banbury, which were switched to diesel multiple unit operation following the phasing-out of steam. As a result the underground carriage sidings in the tunnels were no longer required and the track was lifted.

On 25 April 1974 the privately-funded Wellington Hospital opened to the north of Lord's cricket ground. Originally commissioned by the British and Commonwealth Shipping Group, the hospital had just 98 rooms and three operating theatres. The hospital incorporated the best medical and nursing care, alongside accommodation and service normally associated with a luxury hotel. With the success of the hospital, it was expanded in 1982 when the North Tower was built on Circus Road. The Wellington is now the largest independent hospital in the UK.

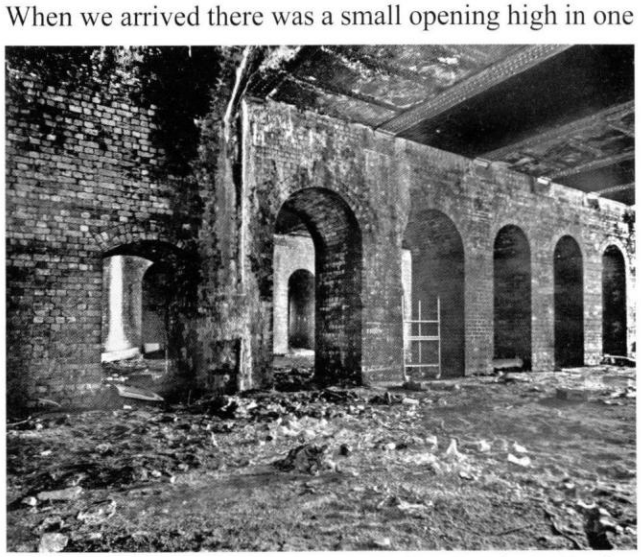


Looking north along the middle tunnel towards the Wellington Hospital basement. The outer wall of the basement is seen in the distance. A small hole was knocked through the basement wall into the west tunnel in 1997; at this time a ladder was required to gain access. The main line tunnel is to the right; the apertures have been filled in at this end of the tunnel. Photo Nick Catford

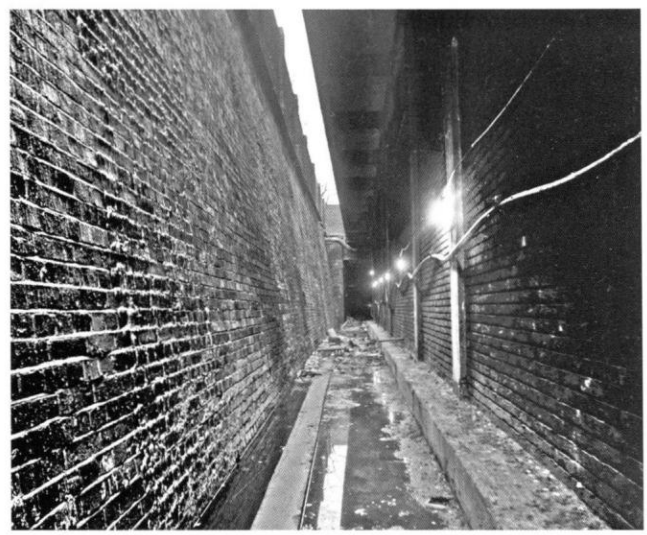
SB expertise in demand

In 1998 the hospital authorities wanted to extend their basement and during exploratory work they broke into one of the abandoned tunnels. As the contractors did not know exactly what they had found, Subterranea Britannica was contacted in March 1997 and asked to investigate the tunnel.

When we arrived there was a small opening high in one wall of the basement. In order to get into the tunnel we had to climb up a ladder, through the hole and down a ladder on the other side. The contractors had already placed some temporary lighting in the tunnel for a short distance. As we walked south along the tunnel we eventually saw daylight as we approached the portal which is the bridge taking the line under St John's Wood Road.



The two parallel tunnels are seen below St John's Wood Road bridge. Marylebone is to the right. Photo Nick Catford



Looking north along the walkway beside the Danubius Hotel. The tunnel portal is seen in the distance. Photo Nick Catford

Beyond the bridge the Danubius Hotel Regents Park has been built on the trackbed between St John's Wood Road and Lodge Road but, as there is no other access to the tunnels a narrow walkway has been maintained alongside the hotel. Beyond the Lodge Road bridge, we emerged onto open land alongside the main line into Marylebone. The overgrown sidings were still in place with buffer stops under the bridge. Modern aerial photographs show nothing has changed with the disused sidings still laid up to Lodge Road. We retraced our steps and after a little research we were able to tell the Wellington Hospital the history of the tunnels.

Land worth millions

In 1999 Network Rail offered the MCC a 999-year lease on the three tunnels for £1.5 million. The MCC failed to agree terms and the lease was eventually bought at auction for £2.35 million by Charles Rifkind, the developer behind the Rifkind Levy Partnership. The lease gave RLP full development rights although Network Rail retained the right to run a train service through the easternmost tunnel. In 2008 the MCC decided that in order to maintain Lords as the world's pre-eminent cricket ground the Nursery (practice) end of the ground should be developed. Leading architects were asked to submit tenders for the development. In July 2008 the winning architect; Swiss based Herzog & de Meuron (best known in the UK for their conversion of the Bankside Power Station to the new home of Tate Modern) drew up their vision for Lords. The ambitious proposal which included underground pitches which would simulate cricketing conditions from around

the world, had the full support of development committee.

Escalating property prices in St John's Wood are such that the land above the tunnels if and when built on is worth £300 million. In return for building high-rise apartments sympathetic to the area the developers offered the cricket club a payment of £100 million.

Looking north towards Lord's cricket ground. The Danubius Hotel Regents Park is seen on the track bed beyond the Lodge Road bridge. Overgrown railway lines can be made out on the left. Photo Nick Catford.

The MCC chairman and treasurer didn't however support the scheme and without putting it to the members the MCC abandoned the plan which had been championed by MCC member and former prime minister Sir John Major, in favour of a smaller proposal whereby Lord's would be remodelled on a stand-by-stand basis over the next 15 – 20 years. The MCC did not include the Wellington Hospital or RLP in this scheme. By the end of 2011 chief executive Keith Bradshaw had resigned and Sir John Major had quit the MCC.

The Wellington had their own plans and were keen to strike a deal with RLP to develop the tunnels without including the MCC. They felt the tunnels would be ideal for a new unit for nuclear medicine imaging of patients with cancer or other related illnesses. They claim there is no other property available in St John's Wood so the tunnel space would be their best option. The tunnels can now only be easily accessed from the hospital.

In October 2012 a revised plan was produced that would be of benefit to the Wellington Hospital, Lord's and the MCC. These include new facilities for both Lord's and the Wellington Hospital at street and first-floor level. The hospital would get their new unit in the tunnels and underground parking while Lord's would get a museum, a new shop, a fitness centre, a new nursery pavilion, guest suites for visiting players, and a sports injury clinic.

There would also be a very small amount of low-rise residential development to help fund the improvements to the Club. Despite the strip of land being classed as 'greenfield' land by Westminster City Council, it would be viewed as 'enabling development' for the hospital enlargement.

In April 2014 a modified version of the 2011 'Vision for Lords' was once again on the table. This latest scheme would see two blocks of flats in the corners of the ground at the Nursery End above the tunnels. By allowing this limited development, the MCC would receive £100 million from the developers to pay for the rebuilding of four stands. Other aspects of the earlier vision would not be included at this time although the tunnels would be used to house unsightly broadcasting equipment.

This latest scheme has been enthusiastically received by the committee. If the MCC Chairman now withdraws his opposition to the development of the Nursery End, this long running saga could finally be drawing to a close when the committee make a final decision on the proposal later in the year. If it is approved, it will then be put to the members. Members have never once disagreed with the committee during the club's 225-year history.

The Club currently has to pay in excess of £150,000 per year on the lease although it is within the grounds of the club. This is reviewed every 5 years with restrictions as to the use related to sporting facilities.

Tunnel visit

A return visit to the Lord's tunnels was arranged for 22 April 2014. Access is from the basement of the Wellington South hospital. The tunnels did not extend much beyond the Lord's northern boundary and the hospital basement is at track level on the north side of Wellington Place where the north end of the tunnel was breached during construction of the Wellington South.

Access is into the west tunnel where a large aperture has been cut through the reinforced concrete basement wall which is now forms the end of the tunnel. Double wooden doors have been fitted. After about 75 yards, a brick wall with a central opening has been built across the tunnel to roof height. Beyond this, the tunnel is clear to the portal at St John's Wood Road. Beyond the portal, the Danubius Hotel sits on the track bed although the narrow walkway along the east side of the hotel has been retained. At the end of the walkway (Lodge Road) there is a secure gate to stop people trespassing onto Network Rail property on the south side of the road.

The east tunnel has been cleared of rubbish and has temporary lighting along much of its length. The west tunnel is unlit and strewn with rubbish and rubble. There is also a wall across the tunnel 75 yards south of the Wellington but without an opening. There are regular apertures linking the two disused tunnels and the third tunnel which is still used by the main line into Marylebone. The apertures between the middle and east tunnel have been securely grilled. Passing trains can be seen from the tunnel.

Sources:

Marylebone Journal,

Property Week 5 April 2012

Architects Journal 24 October 2012

'Keeping Lord's World Class' – A proposal to the MCC to celebrate the bicentenary of Lord's. *The Times* 21 April 2014

Passing Brompton Road

Martin Dixon

Brompton Road station, on the Piccadilly line between Knightsbridge and South Kensington, opened in December 1906 as part of the (then) Great Northern, Piccadilly and Brompton Railway. Passenger numbers were never high due to the limited catchment area and from an early date many trains passed through without stopping. So much so, in fact, that a West End play was produced in 1928 entitled rather bizarrely *Passing Brompton Road* after the cry that was often made by guards at Knightsbridge and South Kensington. Introduction of escalators and a new, closer entrance at Knightsbridge made the station even less popular and it finally closed in July 1934.

Leslie Green's distinctive tiled frontage of Brompton Road station in 1925

The station found a new lease of life in World War II when it was used, uniquely and imaginatively, as the anti-aircraft headquarters for the London area. The full history of the station is related in *Subterranea 17* (August 2008); this article focuses on the more recent Sub Brit visit in November 2013.

Initial disappointment

Two developments catalysed the timing of the visit: the Ministry of Defence's decision to sell the site and Sub Brit's upcoming 40th birthday. We were keen to visit the site before it changed hands (and was likely redeveloped) plus it was on a short-list of possible sites for our birthday celebrations.

The site is currently used as the headquarters of the London University Air Squadron and Linda and I arranged to meet the Adjutant on site. Although the above-ground building includes a drill hall that is available to rent, it became clear that the MoD wouldn't allow 100+ Sub Britters to visit the underground portions of the site even though it is our birthday. As a result we crossed it off our venue list. The adjutant did however agree to pass on contact details of the MoD personnel at the DIO (Defence Infrastructure Organisation) responsible for the building.

After a few telephone calls and email exchanges we got approval for a small Sub Brit group to visit. After we had produced a risk assessment and otherwise demonstrated our competency, the MoD generously gave us permission for the visit to be unescorted. This was particularly useful for photographers who understandably don't all want to be part of a single escorted group getting in each other's way.

We felt that a members' ballot for the spare places was better than 'first come first served' and the names drawn from the seventy applicants included members from Yorkshire, Derbyshire and Leicestershire as well as the Southeast. Attendees confirmed and joining instructions sent, we all awaited the day of the visit.

Visiting Day

After meeting up, we had a few minutes to spare and under the guidance of Robert Wood tracked down a KGB dead-letter box (DLB) in the adjacent Brompton Oratory. It seems bizarre that Soviet agents were exchanging classified material just yards from an active MoD building as late as the 1980s. For those interested, the DLB is behind the pillar to the left of the copy of Michelangelo's *Pietà,* itself to the right of the entrance door.

The top of the ventilation shaft protruding from the roof of the station building. This shaft must be incorporated into the new development

Back at our own meeting point and with a full turnout, we gained admission to the site via the Orchard Place entrance. Paradoxically, we started our underground visit with a trip to the roof. From here we could see the top of the ventilation shaft that still occupies half of one of the lift shafts. Retention of this ventilation is a condition of purchase for the new site owners.

The northern roof area also has a large flat area that was used as a parade ground – the remains of what looked like a flagpole being on the southern side. John Poole remarked that he had worked in retail on the opposite side of Brompton Road for 17 years and never dreamt he'd be on the roof looking down on his former shop all these years later.

Soon it was time to descend for the visit proper so after kitting up we made our way along the ground floor past

the local Air Training Corps (ATC) office and the toilets. Interestingly, the toilets are marked on the original construction plan but for some reason the ladies' and gents' are now reversed. The tops of the lift shafts were not accessible and are presumably capped with a generous layer of reinforced concrete.

The original tiled staircase leading down to the emergency stairs

We caught our first glimpse of classic early London Underground tiling and descended to basement level down an original mahogany-banistered staircase. This led to the level used in station days as staff accommodation and storage. From here, a magic key gained us access via a sturdy door to the top of the original spiral stairs.

Reconfiguration of Shafts

From north to south there are three shafts – all original – now configured as follows:

Lift shaft number 1

Half of this shaft is open top to bottom as a 'D' shaped ventilation shaft, the top of which we had already seen on the roof. The bottom end emerges into the original lower level lift exit (now in TfL rather than MoD hands). The other half of the shaft is a series of four stacked D-shaped rooms that were used as support accommodation in World War II. Between the two D-shaped segments runs a staircase that zigzags the full length of the shaft.

Lift shaft number 2

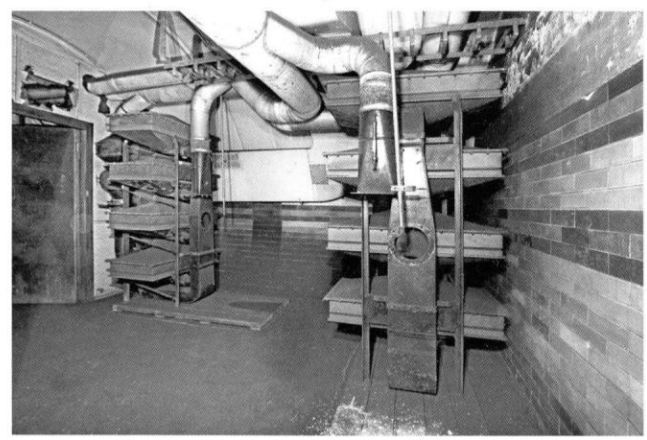
This shaft has been converted to four circular rooms, filling the entire shaft. These were designated from top to bottom Gun Operation Rooms (GOR) 1–4.

Spiral emergency stairway

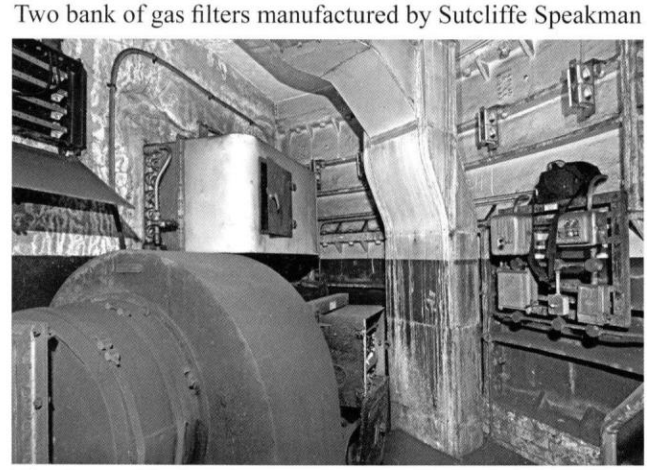
This remains in more or less original condition and provides access to the intermediate Gun Operation Rooms (2 and 3) via cantilevered platforms. These are necessary as the spiral staircase does not exactly coincide with the new floor levels where the two shafts have now been knocked through to provide entrances to the GORs.

From the locked door the group split up and we started our visit by descending the stairs in the most northerly lift shaft. This is now of course entirely empty of lifts and machinery. Little remains but there are some official notices (mostly concerning fire procedures) which date from the 1950s. The room second from bottom holds a secure steel chest secured to a substantial concrete plinth with a hasp for a padlock or similar. This was presumably for ammunition, secret papers or other valuables. Ammunition seems the most likely as on the level below there is a wooden rack obviously intended for service rifles.

Emerging at the bottom of the D-shaped shaft, the stairway opens onto the original tiled passage that leads to the disused platforms. The platforms remain in TfL hands but part of the passageway is still accessible. Through a locked grille door the overbridges can clearly be seen and the frequent passing trains produce a significant draught. Draught that over the years has coated most surfaces with a generous helping of dust. Two banks of gas filters by Sutcliffe Speakman are located here and adjacent steps lead down to a small air-conditioning plant room with a fan in the well of the D-shaped shaft.



Two bank of gas filters manufactured by Sutcliffe Speakman

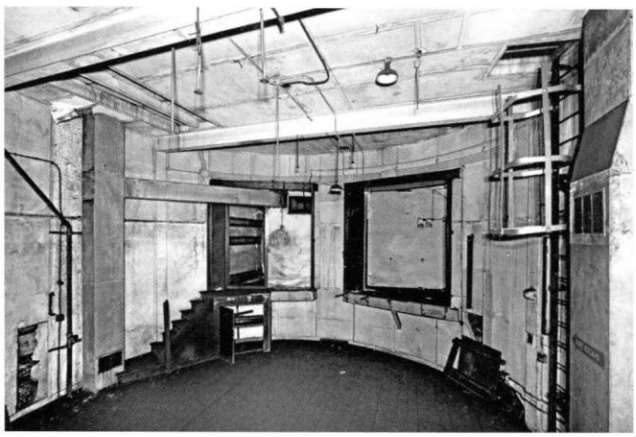


The air-conditioning plant room in the well of the D-shaped shaft

Gun Operations Rooms

The passages around the shaft bottom in MoD hands hold wartime electrical equipment and two banks of gas filters by Sutcliffe Speakman. The electrical switchgear includes a 50-volt emergency lighting circuit with an associated mercury switch. We continued the visit by entering the bottom Gun Operations Room (GOR 4) which is in the bottom of the second lift shaft and controlled anti-aircraft defences protecting south London.

This was probably the most interesting room – entered via the original lift passage and then steps down into the lift well. The short entrance passage included one nine-by three-inch tile labelled with the manufacturer 'Maw and Co' and their sole London agents 'W B Simpson and Sons'. These tiles can still be seen in a few active stations for those with a keen eye.

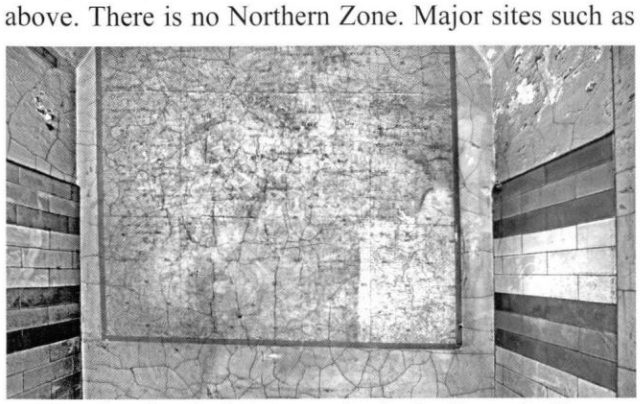


Gun operations room 4 is located in the well of the lift shaft and is accessed through one of the original openings onto the up side of the lower lift landing

From the bottom of GOR 4, the other lift entry and exits are all blocked up. The former exit diagonally opposite the current entrance has a fascinating Cassini WO (War Office) large scale map of South London and north Surrey, south of the LCC area, showing the Rural and Urban District Council areas and boundaries. Marked on this heavy anti-aircraft (HAA) gun sites of the 'Inner Artillery Zone, South' which are shown as red and green circles as follows:

ZS 18	Raynes Park
ZS 17	Mitcham Common
ZS 15	Norbury
ZS 12	Beckenham
ZS 26	Thornet Wood
ZS 5	St Paul's Cray
ZS 10	Hayes
ZS 13	Shirley Park

These indicate that this is probably the Southern Zone GOR, with the Eastern and Western Zones in the GORs above. There is no Northern Zone. Major sites such as mainline stations and Buckingham Palace are also shown. The Brompton Road site is indicated with the label 'G.O.R.'. Other fixed defences are also shown including a number of 'Z battery' multiple rocket defences, the nearest in Battersea Park.

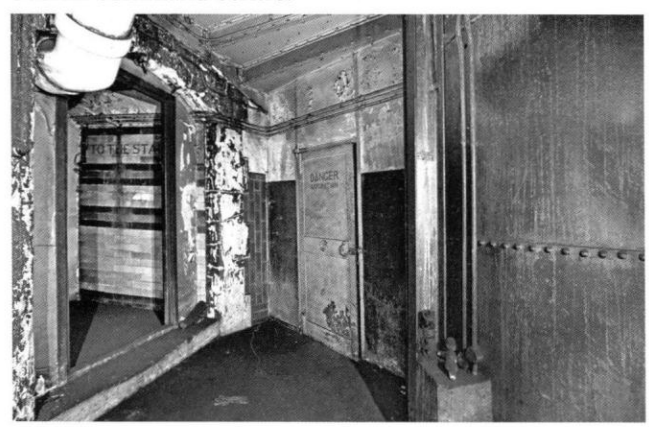


Map showing the HAA gun sites in the 'Inner Artillery Zone, South' is stuck onto the brick wall that blocks the opening onto the down side of the lower lift landing.

The map is stuck firmly onto the brick wall now blocking the exit onto the down side lower lift landing which is still controlled by TfL. This accounts for why this map is still in position. The only way of removing the map would be to dismantle the brick wall which would probably do irreparable damage to the map.

We were then able to start our ascent using the spiral staircase and visit GORs 3 to 1 in turn. En route we passed some more fine original tiles directing us 'TO THE STAIRS' with a couple of arrow tiles. This panel is set within light brown and green borders.

There are no artefacts in the remaining rooms but each floor/ceiling has vertically-aligned trap-doors measuring perhaps 8 feet by 2 feet which would have been used for moving plant and equipment between levels. Between the top three rooms there are also ladders and trap-doors acting and labelled as fire escapes. The vertical ladders appear to have had partial protective cages fitted at a later date. Gun Operations Room 3 controlled north London defences, while GOR 2 originally held telephone equipment and intelligence officers and GOR 1 was the overall command centre.



Ammunition room near the bottom of the emergency stairs

GOR 5 was an emergency fall-back site at platform level that is now outside MoD ownership. We were unable to visit GOR 6 – allegedly the nickname of the adjacent *Gladstone* pub and now sadly demolished. After leaving the site with our grateful thanks, the party retired to a nearby coffee shop – also underground and echoing to sounds of passing trains. Here we compared notes and reflected on a splendid visit.

As the trip went smoothly, I did ask about a second visit but unfortunately the MoD have now exchanged contracts on the site and it is off-limits. We did however ask that if the new owners ever wanted to know more about what is beneath their purchase then Sub Brit would be only too glad to show them round!

All the new photographs were taken during the Sub Brit visit. © Nick Catford

London North West Group War HQ bunker in Southall – Sub Brit visit October 2013

Chris Rayner

Beneath a primary school in Southall, northwest London, an important Civil Defence underground bunker used for four decades still survives. It was first used in World War II as one of five sub-regional ARP/Civil Defence Headquarters tasked with collecting information from a number of outer London boroughs and feeding it back to the Regional Commissioner's War Room. It continued to be used as a War Room during the Cold War until at least 1980, the only one of the five sectors to have retained its wartime site.

Several SubBrit RSG members visited the bunker in 2001 to document its condition; their report – www.subbrit.org.uk/rsg/sites/s/Southall/ – on our website shows an underground bunker in a desperate state. The site was flooded, and abandoned papers, timber and other material were rotting away. A gas monitor used by the group indicated potentially dangerous conditions in some rooms, and the report carries a warning to future visitors about the risks of releasing hydrogen sulphide by disturbing water containing rotting timber.

The kitchen and to the rear the GPO frame room. These were originally two rooms but the partition wall has collapsed as has the corridor wall along the left side. Note the high water mark along the wall above the floor.

Water ingress had been a problem even while the bunker was operational, but it accelerated dramatically when a primary school was built on ground above it in 1983 and it is thought that this may have damaged the underground structure and whatever tanking it may have had.

Southall revisited

When the London Borough of Ealing Architects Department invited Sub Brit this year to help reassess and interpret the structure, twelve years on, one of the incentives for a small group visit was that the bunker would be pumped clear of water for the occasion.

Asbestos is still present at various points in the bunker and so we had to don a regulation white Tyvek suit complete with hood and a FFP3 (filtering face-piece) mask. An unexpected highlight was the face-mask "airtight test" which included an odour smell test, in which a bag was placed over participants' heads and an extremely noxious aerosol was squirted in. Luckily only one of us got to find out how unpleasant it was.

Blimey, I didn't realise that going underground would mean a breath test! (caption winner Stewart Wild)

The L-shaped bunker originally had four entrances but only one is accessible today. Pumping-out was still in progress (wellington boots were essential as some rooms still had a small amount of standing water) as members descended at the knuckle between the two legs of the L-shape. The longer leg runs east under the school up to the main road, while a slightly shorter one, including the operations and plant rooms, runs south under the playground. For a more detailed description it is recommended that one reads the 2001 visit report, although this started by the main road, at the eastern end of the long leg.

History and background

The size of the bunker was surprising and may be a clue to its retention into the Cold War, despite its lesser degree of bomb protection. Sub Brit member Keith Ward has researched the site and found that it was originally built as the basement of the planned new Town Hall in 1938. Local Authorities had been charged with planning for civil defence against potential air raids in 1935 and so would have planned in a reasonably bomb-resistant shelter, although the above-ground Town Hall was abandoned after the outbreak of war.

Keith's recent research has revealed that the bunker was used during WWII as the Southall local authority control and as a sub-divisional control for five adjoining boroughs feeding information to the Middlesex Group Control at the Middlesex County Council offices at Brentford. During the war the London County Council area and Middlesex County area were merged to form a combined civil defence area under the control of the Regional Commissioner. The Middlesex County Control was in a purpose-built above-ground structure on the Uxbridge Road at Hatch End, with a standby site in Wembley.

Some signs remain to indicate who occupied a particular room. This one is Control and Co-ordination – Police and Fire Liaison.

In 1941 the County Control moved to Hendon Technical College. Middlesex Group controls reported to both the County Control and to the main London County Council Control.

Postwar there were many changes, in part resulting from local government reorganisation. For example, in 1951 the site was designated as Southall Borough Control and also sub-divisional control for Southall/Ealing/Hayes and Uxbridge local authorities. From 1965, it was under new London Borough of Ealing control. In 1968 it was put on Care and Maintenance, technically closed but with the potential to recommence operations at a later date, and in 1971 it was redesignated as Ealing Control.

In 1974 the Greater London Council (GLC) was establishing regional control of London into five areas (during the previous nine years from 1965, London had been controlled from Sub-Regional Controls at Cambridge, Basingstoke/Warren Row and Dover, with a communications centre at Tunbridge Wells).

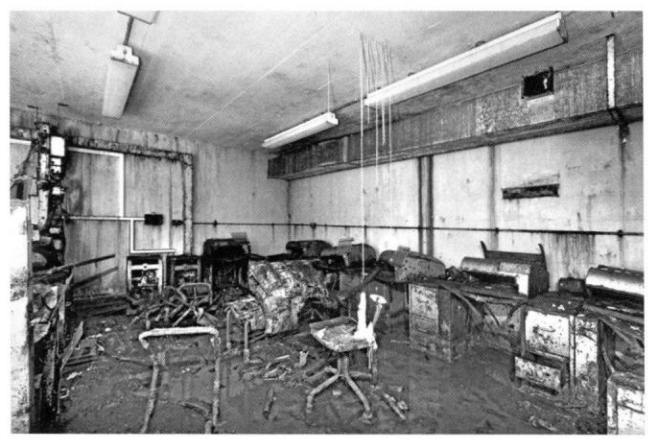
The GLC were looking at reusing the old London War Room sites, but Southall was ideal as it had enough space for both the Borough Control and also the GLC Group Control for North West London. Due to the GLC's political stance on civil defence, little was actually done to the five Group Control locations, despite the official designation in 1976.

In about 1982 Southall was seen as no longer viable as the North West Group Control, and despite the GLC looking for alternatives half-heartedly, a 1991 communications diagram for the London Fire and Civil Defence Authority (LFCDA) shows neither the North West London Group Control nor the derelict North London Control War Room at Mill Hill as having any communications links.

The bunker today

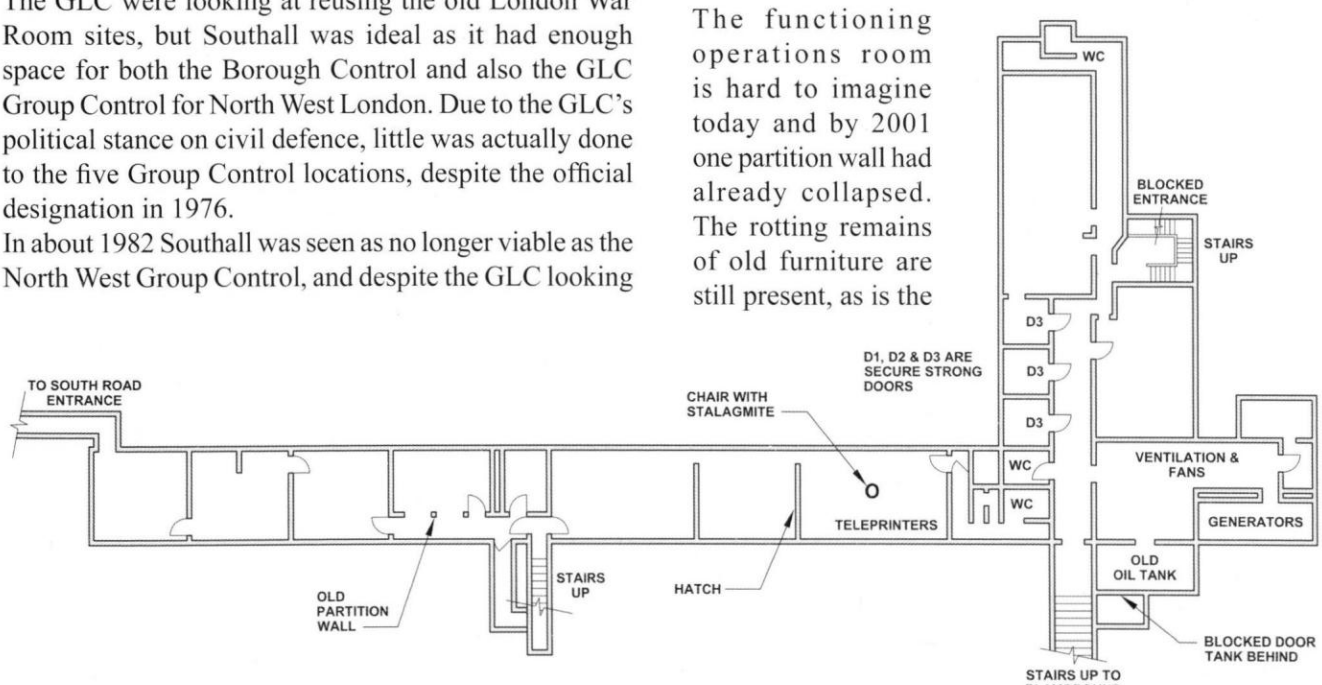
Reaching the base of the concrete staircase and looking south, one faces a wide corridor. Temporary lighting had been installed. On the right, the plant rooms were unfortunately cordoned off because of the greater concentration of asbestos in them. On the left, there were three heavy metal doors such as one might find on a safe. These were originally destined as strong rooms for the Borough's papers and regalia.

Today just rusting cabinets and debris remain in the first two, while the third has had an opening knocked through its south wall as an alternative access to the large Operations Room, the largest room in the bunker. This doorway was roughly cut through the reinforced concrete vault wall and never finished off – clearly a late change at some cost for an unknown reason.



The tape relay room with its rusting teleprinter cases

The functioning operations room is hard to imagine today and by 2001 one partition wall had already collapsed. The rotting remains of old furniture are still present, as is the



HAMBROUGH BUNKER - FLOOR PLAN
Drawn by Tim Robinson

Equipment rack in the tape relay room. The rack contains a mixture of relays and valve amplifiers, the latter for voice-frequency circuits. The openings in some case covers would suggest that these give access to presettable controls for adjusting signal gain levels. The second row down is a fuse panel with two rows of fuses. Further down are either valves or neon stabilisers for critical power supplies. Below that a patch panel enabling (perhaps) different teleprinters to be connected to a choice of circuits.

rusting map cabinet in the passage to the east-end toilets and main-road entrance.

The longer east leg begins with a dog-leg around some fairly grim toilets, possibly to deflect blast if the bunker was ever penetrated by a bomb. Next in line was the most interesting room for most of our group, the Tape Relay Room with its teleprinter tables and cases, some still with their GPO badges surmounted by a crown. The teleprinters are individually labelled with the names of the reporting boroughs that were in the North West Group, with additional ones for the Metropolitan Police and UKWMO (United Kingdom Warning and Monitoring Organisation).

The sequence of derelict rooms that follows begins with the communications rooms and then kitchen, but the fallen corridor partitions make distinctions less obvious. Nearer the eastern end the rooms need to be crossed diagonally to reach the next room in the sequence, and their function is unknown.

Prospects for the future

The children of the Primary School were fascinated by their white-suited visitors, and the Headteacher is very interested in the idea of making use of the bunker as a teaching resource once watertight and cleared of asbestos and dangerous muck and debris.

A couple of members, Keith Ward and Nick Catford, both stayed after the end of the school day to escort the Headteacher and a dozen or so of the female teachers around the bunker and explain how it was used. This has helped to engage their interest in preserving the site, and coupled with the Borough Architect's repair investigation works there is a greater likelihood that the site has a long-term future.

A visit by a much larger Sub Brit group once the bunker is watertight and free of asbestos, but before any other restoration works are carried out, is very much on the cards.

Many thanks to the London Borough of Ealing's Chief Architect and his colleagues and the Headteacher of Hambrough Primary School for facilitating the visit, and to Keith Ward and Nick Catford for information provided in the course of writing this.

All photos Nick Catford

Autumn Meeting 2014 and Visits Day in Newcastle

Following the very successful regional meeting held in Liverpool in 2012, we have again arranged our Autumn Meeting outside of London, to be followed by a day of visits. This year we will be in **Newcastle upon Tyne.**

Autumn Meeting: Saturday 11 October 2014

On the Saturday there will be a strong programme of talks with both a local and wider flavour. This includes Ian Holloway on the eventful history of the Victoria Tunnel in Newcastle and Phil Catling (a SubBrit member) on Stockport's large and well-appointed air-raid shelters.

Visits Day: Sunday 12 October 2014

There is a planned programme of visits the next day. These will potentially include parts of the Victoria Tunnel, the Ouseburn Air-Raid shelter and the Control rooms of both the Metro and the Tyne Tunnels.

Details and Booking

Please see the flyers enclosed with this magazine for full details of both the Autumn Meeting and the Visits Day and with details of how to book and pay.

Accommodation in Newcastle is not included but we hope to be able to give some suggestions.

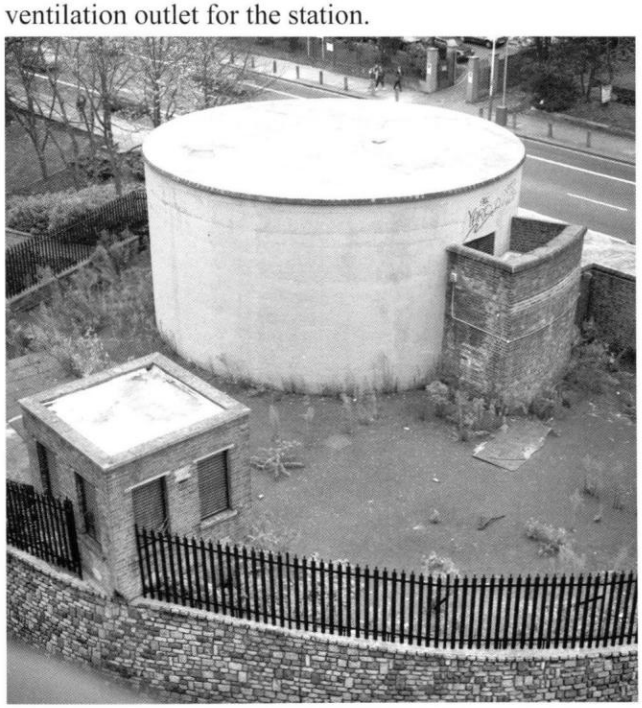
Clapham North Deep Shelter Gets A New Tenant

Nick Catford

Additional text from Andrew Emmerson's book *London's Secret Tubes*

The London deep-level air-raid shelters are eight deep-tunnel shelters that were built under a number of London Underground stations during World War II. Each shelter consists of a pair of parallel circular tunnels 16 feet 6 inches in diameter and 1,200 feet long. It was planned that after the war the shelters could be used as part of new express tube lines paralleling parts of the existing Northern and Central lines.

Ten shelters were planned, but only eight were completed: at Chancery Lane station on the Central line and Belsize Park, Camden Town, Goodge Street, Stockwell, Clapham North, Clapham Common and Clapham South on the Northern line. The other two were to be at St. Paul's station on the Central line and Oval station on the Northern line but these were abandoned during construction due to adverse ground conditions. The working shaft for the shelter at Oval now functions as a ventilation outlet for the station.



The north entrance to the Clapham North deep shelter on Clapham Road. The small building on the left is the exhaust ventilation shaft. It also had a winch for lowering heavy items into the shelter. The bottom of the shaft is in the plant room.

Each shelter was built mainly to similar specifications and four different contractors were employed to do the work. Clapham North was built by leading tunnelling company Kinnear Moodie & Nuttall. During the construction of the shelters there was a proposal to extend the main shelter tunnels with an additional 100 feet at each end increasing them in length from 1200 to 1400 feet. At that time, it was noted that the shelter tunnels at Clapham North and Clapham Common were only 650 feet apart and there was a plan to connect the two shelters together underground. The proposal was, however, not adopted.

The photographer is on the upper lift landing looking towards the steps up to the Bedford Road entrance. This entrance arrangement differs from all other deep shelters

Capacity for 8,000 Londoners on two levels

The twin tunnels were divided into an upper and lower deck and were linked at five points by cross passages at equal distances along their length, with two situated at the extremities resulting in sixteen sections of approximately 325ft in every shelter. Each of the sixteen sections had bunks for an average of 500 persons, but no similar facilities were provided in the cross passages that gave access to lavatories, medical aid posts, control rooms and switchrooms. As a result a capacity of 8,000 persons per shelter could be provided. The original proposal was to accommodate 9,600 people in bunks but this figure was later reduced to 8,000 in order to provide better living conditions.

Each shelter was built with two entrances at the surface plus staircases from the tube station platforms above giving access to the cross passage at the centre of the shelter. At all shelters spiral staircases led from the cross passages at each end to the two entrances which consisted of a circular concrete 'drum' with small brick extensions on opposite sides that housed the entrance doors.

A small lift ran down the centre of each stairway shaft; these were intended for supplies rather than the public but eventually the elderly or infirm were allowed to use them if required.

Clapham North deep shelter

The north entrance at 400 Clapham Road followed the usual pattern but the south entrance, which was in York Terrace Yard, Bedford Road, immediately behind Clapham North station itself, was different. Here the

spiral staircase stopped some distance short of the surface from where an inclined stairway led up to York Terrace Yard. There is no documentary evidence explaining why this arrangement was necessary. It is assumed that there wasn't suitable land available had the shaft extended straight up to the surface.

Mechanical ventilation was provided at all sites, as was a sewage ejector plant, a necessary expedient due to the shelter being beneath the existing main sewer systems. As a result of the tunnels' cylindrical design some attention had been given to the greatest possible freedom for traffic circulation. A system of folding bunks was therefore devised with transverse bunks occupying one side and longitudinal bunks the other. The former comprised double three-tier bunks, their solid headboards forming alcoves that contained six bunk spaces.

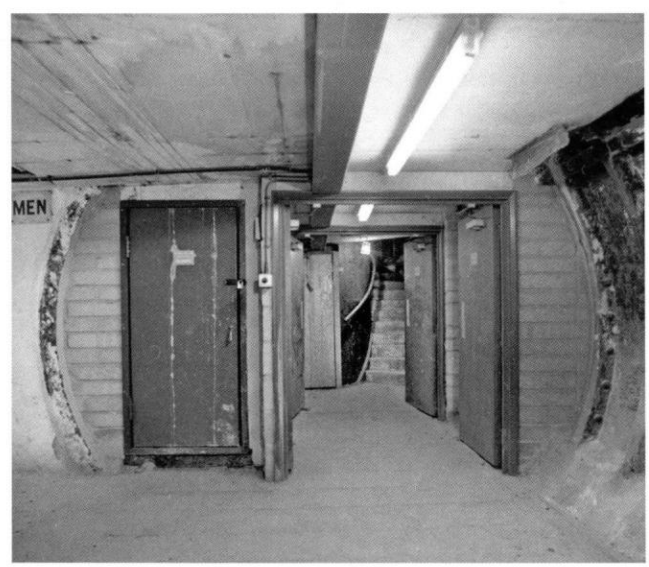
The lower level. The raised area was for transverse bunks with longitudinal bunks on the right. Both sides would have had three tiers of bunks as seen in the picture of the Clapham South shelter below. No pictures of the Clapham North shelter in use have come to light

The centre bunk of each tier could be used as a seat, the upper bunk becoming its backrest when lowered. The longitudinal bunks were also in three tiers, but provided five bunk spaces on the upper floor using two double-width bunks and four bunk spaces on the lower floor. This style of bunking could also be folded back against the tunnel lining to give continuous seating along its length and a gangway six feet wide.

Eight canteens were incorporated into the plan of each shelter where emergency reserves of food were held, sufficient for three overnight occupations should outside suppliers be incapable of providing provisions.

Each section of the shelters could be partitioned off from those adjoining by using a light wire-mesh barrier, allowing a partial occupation. Therefore as the shelters were opened following an alert, two sections would be brought into immediate use. The system devised decreed that the end of one shelter tunnel nearest the control room would be the first to receive members of the public, and one entrance drum opened together with access from the adjoining tube station. As demand increased, further sections of tunnel would be made available until half the shelter was full, at which point the second entrance to the north would be opened.

The first complete shelter was ready for occupation in March 1942 and the others were finished later in that year. The shelters at Clapham South and Clapham North were expected to be the first to open but Clapham North wasn't handed over to the management committee until 30 November 1942.



The lower lift landing of the Clapham Road shaft. The locked door is to the plant room. Both door and frame have now been removed. The men's toilets are to the left. This is one of only a handful of original signs left in place

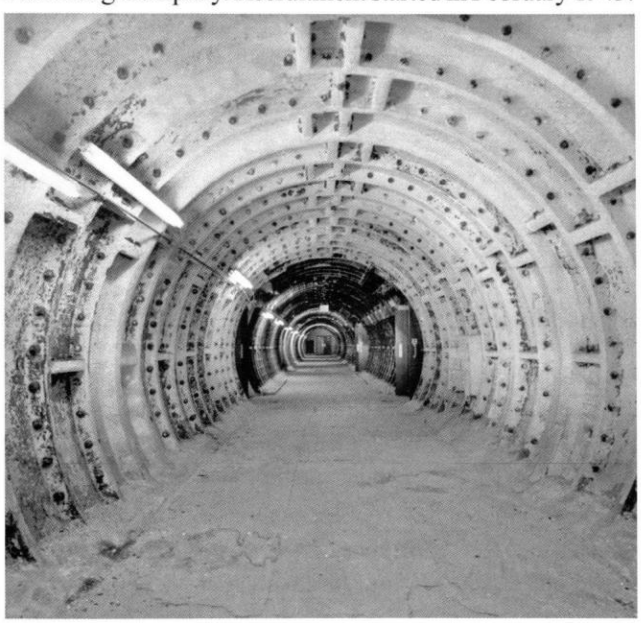
Section names

All the deep-level shelters were sub-divided into sleeping areas. Each tunnel was divided into four sections with connecting doors between them. Each section was given a name; at Clapham North they were all famous poets and authors. (See table, right)

There were 8,112 bunks in total and each bunk was allocated to a named person. If they didn't turn up one night the bunk remained unused. The capacity of each section is shown.

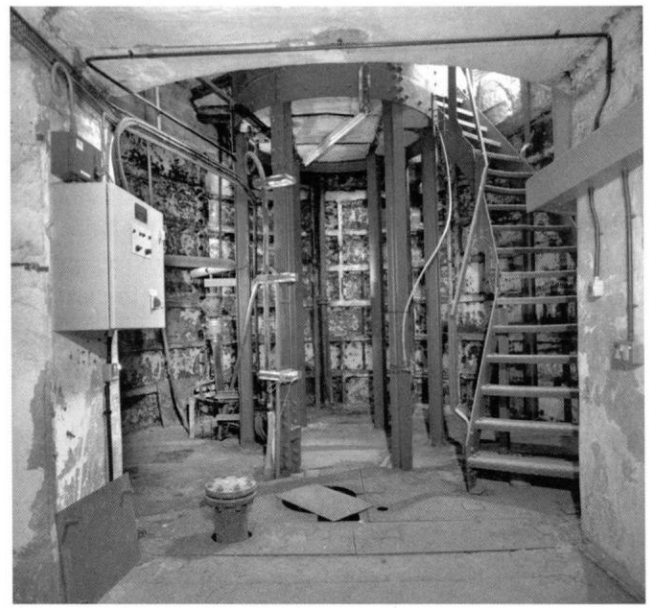
As the shelters were completed, the government was urged to open them to the public to relieve the strain on those tube station platforms that were being used as shelters, causing obstruction both to passengers and to the operation of the Underground railway. The government refused, stating that unless there was an increase in air raids, the shelters would be kept in reserve.

There was soon however a change of mind. In November 1942 there was a request to billet troops coming to London on leave. This was quickly approved, with the Chancery Lane shelter opening on 5 December 1942. At Clapham South and Stockwell, wardens were recruited from the general public but at the remaining sites business organisations agreed to recruit wardens from amongst their staff, those for Clapham North being provided by the Boots Pure Drug Company. Recruitment started in February 1943.



Cross passage on the lower level running from the bottom of the Bedford Road shaft. The lift is at the far end

Realisation now dawned that a limited opening of the shelters would be a good means of gaining practical experience of shelter management, and the opening of other shelters soon followed. National Fire Service male personnel were allowed into the Clapham North shelter from 12 May 1943.



The low-level plant room at the Bedford Road entrance. The sewage ejectors were located to the left of the stairs

With the arrival of German flying bombs the government finally agreed that all shelters should be available to the public and Clapham North opened on 14 July 1944. Regular shelterers at nearby tube stations and homeless people were given admission tickets, but demand was not high and by September some of the unused spaces were made available to troops on leave.

Postwar use

After being open to the public for only a few months,

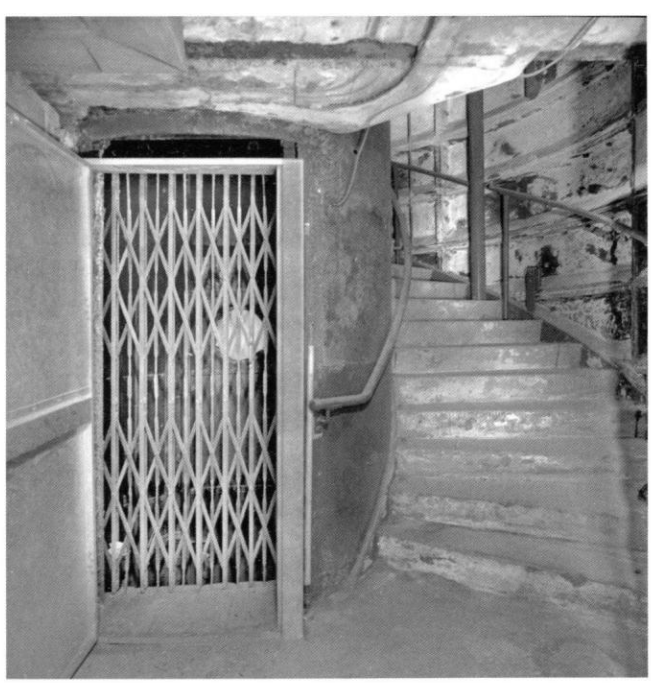
Entrance	Name of section	Spaces in cross bunks	Spaces in longitudinal bunks	Total bunk space
400 Clapham Road - North	Burns	240	210	450
	Fielding	263	205	469
	Arnold	228	275	503
	Emerson	240	275	515
	Lytton	228	136	364
	Shakespeare	346	156	402
	Kipling	270	172	442
	Ruskin	282	192	474
York Terrace - South	Carlyle	318	270	588
	Hardy	291	260	551
	Dickens	270	300	570
	Johnson	288	385	673
	Milton	315	194	509
	Tennyson	291	184	475
	Pepys	318	204	522
	Wordsworth	381	224	605
TOTALS		4,470	3,542	8,112

Clapham North was closed on 21 October 1944. There was some very limited postwar use as a document store for the Board of Trade and the Public Record Office but this ceased in August 1951. In the summer of 1953 the shelter was used as a naval billet during the Coronation.

In 1975 the Government's Property Services Agency (PSA) placed advertisements in London and national papers worded: **Former Tube Shelters in Central London to be Let**. Leases on seven shelters (not Chancery Lane which by then was in use as a secret telephone exchange), each having a floor space of 94,000 sq feet and 'the highest security', were offered for 'commercial or other uses'. By the 1990s the seven deep shelters were managed by Property Advisers to the Civil Estate (PACE). By 1998 PACE was in the process of disposing of all seven shelters.

They were offered for sale and were all purchased by London Transport 'to assist with the upgrading of the Northern line'. At some time, probably in the 1990s, the Clapham North shelter was completely cleared and all the bunks were removed, leaving bare tunnels. The lifts were removed and the electrical switchgear was replaced.

It is not known if this was in preparation for a new use but as a result, as the shelter no longer had lifts, it proved impossible for London Transport (now TfL) to find a new user. While the other six shelters found new uses as an archive or document store, Clapham North remained empty and unused.



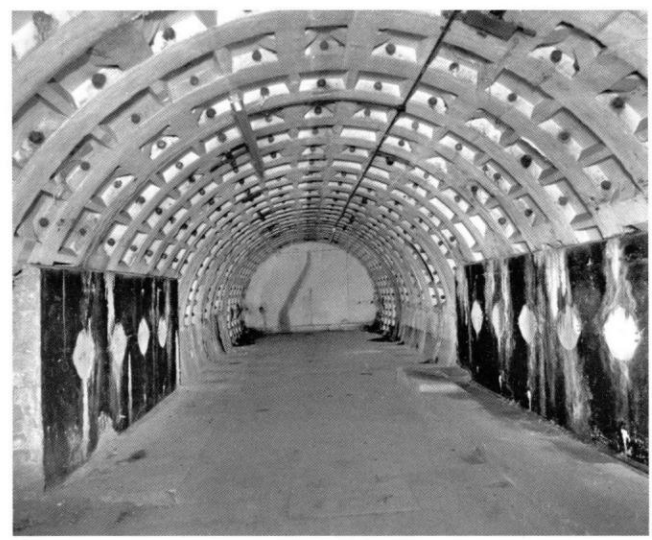
The lift landing on the upper deck at the bottom of the Bedford Road shaft

A few years ago a storage company was interested in using the shelter, but it has always been damp and humid. They stacked empty cardboard boxes in an area of the upper level and left them for a few months. The boxes got very damp and started to fall apart so the company lost interest in taking a lease on the shelter.

Sub Brit visit in January 2009

As it had never been possible to lease the Clapham North tunnels it was always the easiest of the eight shelters to visit, and the Clapham Society made a well-documented visit in 2006. On 24 January 2009 it was our turn.

The visit was arranged by Sub Brit member Philip Lindhurst who, through his contacts, was able to arrange a self-guided visit with no restrictions on time. That's just how we like it. The keys were kept at Clapham North tube station so a large group of Sub Britters met at the booking office at the appointed time.



Men's toilets at the bottom of the Bedford Road shaft. The white marks on the black walls show where the cisterns and down pipes once were

Having collected the keys, we walked round the corner to the Bedford Road entrance and let ourselves into the yard at the rear of the station. It wasn't locked as there were electrical contractors working on site. The usual way in to deep shelters is through one of the large circular entrance drums that must be very familiar to people regularly driving along the A24/A3 through south London.

Clapham North is the one exception. There are three small brick buildings and one larger one in the yard. One is the top of the ventilation shaft with vent grilles round the top. The role of two other buildings is unknown; one has a sign that says *Ministry of Public Building and Works – these doors must not be left open* and an adjacent sign says *No entry to unauthorised persons*. Our way in was through the fourth larger building with an air intake ventilator on the top. There were two sets of doors into this building; one side was a London Electricity Board equipment room. Our way in was on the other side through double metal doors secured by a chain and padlock. Luckily our key fitted – on a subsequent visit it didn't as the lock had been changed and nobody told the station staff!

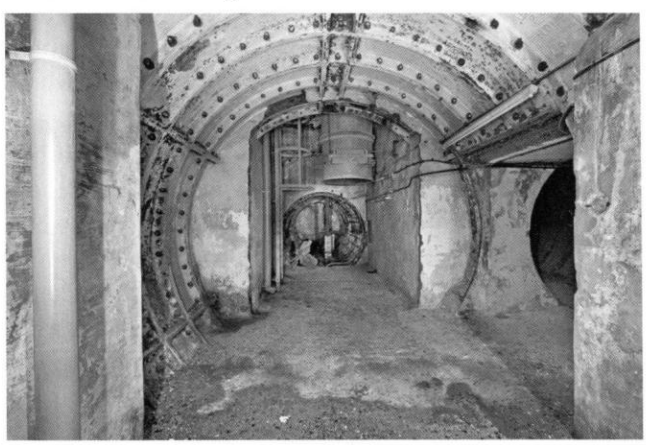
Once inside the building we found ourselves in a fairly large 'L' shaped room with a timber-built c.1980s security post with a window. A sign below the window said *All personnel & visitors must check in and out with security guard*. There was a PSA *No smoking* sign next to the

window and a health and safety poster. It is likely that this was all for the benefit of the contractors when the shelter was stripped of all fittings between 1975 and 1990.

On turning the corner we were at the top of a wide stairway that went down about 60 feet with an intermediate landing halfway down. At the bottom of the stairs there was a sign on the wall with an arrow pointing up and the word *Exit;* this appeared to be original and was one of the few original signs remaining in the shelter.

At the bottom of the stairs we arrived at the top of the double spiral staircase down to the shelter tunnels; the lift shaft runs through the middle of the spiral. There is an outer lift door but on opening it we could see that the lift and all the lift mechanism had been removed. We made our way down the 178 steps to the two-level shelter tunnels below. At this point everybody scattered in different directions and I was on my own.

At the bottom of the staircase there was a sign that said *Caution – these stairs do not conform to regulation size and width under H & S Act 1974*. It's lucky I hadn't seen a similar sign at the top of the stairs as that might have been the end of the jaunt!



The bottom of the Bedford Road ventilation shafts. One shaft is behind the photographer, the other is straight ahead with the ladder running a short distance up the shaft. A fan is seen at the bottom of the shaft. The passage on the right leads to the sewage ejectors and the lift machine room

The plant-room door on the lower lift landing was locked and we were unable to gain access on this occasion.

On a subsequent visit in April 2014 the hinges of the plant room door had been cut off and the door was leaning against the wall. This plant room differs from all other deep shelter plant rooms because the south entrance to the shelter is offset from the shaft by about 50 feet. Steps led down to the plant room which was at a lower level. There was a sump at the bottom of the steps but all the sewage ejection plant has been removed. Straight ahead there is a junction with one tunnel running to the left at right angles.

Beyond the junction there is a set of double doors which open onto the lift machine room. This originally contained a large mains transformer, a mercury vapour rectifier in a cabinet and two floor-standing cabinets with rheostats for controlling the speed of the lift. There was also electrical switchgear, an engineers' work bench and cupboards part of which is still there.

The tunnel at right angles is about 50 feet in length, at the end there is a tight turn into a parallel tunnel with two shafts to the surface, each with a fan at the bottom. Each shaft has a new ladder running up for a short distance.

Back to January 2009. It was soon apparent that the shelter had been stripped back to bare walls. All evidence of the bunks had been removed along with all other fittings; all that is left is bare tunnel linings, doors between sections and stairs between the two levels. Virtually everything else has gone.

Lighting remains on

The tunnels are partially lit but as the lights stay on 24/7 many of the tubes are no longer working. The toilets were located in one of the side passages near the bottom of the lift shaft. Marks on the walls indicated where the toilet pans had been but other than that the room was as bare as the rest of the shelter. I walked along the lower level shelter tunnel, and found at the midway point a short flight of steps that led up to a small room. (In the Clapham South shelter the same room is still identified as the medical aid post.)

The empty Clapham Road lift shaft running through the centre of the double spiral staircase. A new lift will be installed here by TfL in 2014

Halfway between the two entrances a wide stairway leads to Clapham North station platforms which are at a higher level. The connection at the top of the stairs has been thoroughly sealed with TfL now utilising a short section of the access tunnel as an equipment room.

At the bottom of the Clapham Road northern shaft everything was much the same. The plant room was again locked but I found a hatch in one of the side passages. On opening it there was a service tunnel with pipes. It was awkward as not only was there a pipe running along the tunnel but there were other pipes running across the tunnel that had to be clambered over. But with care I was

able to make my way along the tunnel and down into the plant room which, as at the Bedford Road southern entrance, was below the level of the bottom shelter tunnel – at most other shelters it is on the same level.

The plant room was divided into two with a set of double metal doors in the centre. The main door opened on to a flight of metal stairs down to the lower level. There was a sump in the floor at the bottom of the stairs but the sewage ejection plant around it has all been removed. Moving along, I came to the exhaust air shaft. There was a fan in the bottom of the shaft, but this has been removed and is now lying on the floor. A new ladder with a safety cage around it now runs part way up the shaft.

Beyond the double doors was the lift equipment room. This originally contained a large mains transformer, a mercury vapour rectifier in a cabinet and two floor-standing cabinets with rheostats for controlling the speed of the lift. There would also have been electrical switchgear, an engineers' work bench and cupboards. Once again everything had been stripped out and the room now only contains some new electrical switchgear on the wall.

I climbed to the top of the Clapham Road shaft where some refurbishment work was clearly still under way as there was a kettle and a radio sitting on the table and a wheelbarrow by a recently bricked-up wall. The inner walls of the drum had been recently painted but all the work was for nothing as it would be another four years before TfL would be able to find a new user for the shelter. At the top of the stairs there was a sign that said *DOE/PSA Clapham North Deep Shelter Instructions. All electrically operated tools must be low voltage 110V or below.*

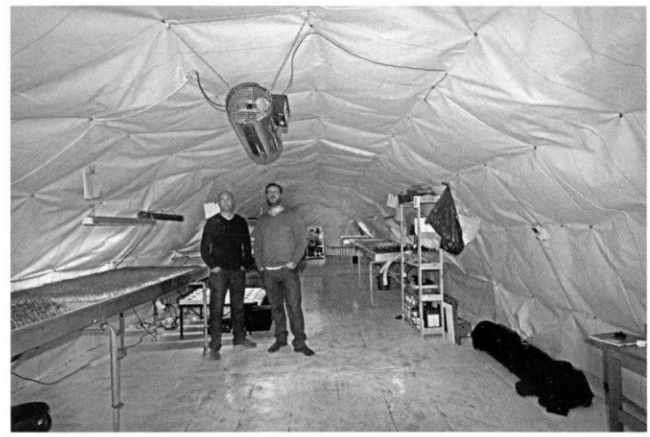
Having spent two hours exploring and photographing the shelter, it was time to go. I retraced my steps back down the stairs, along the upper-level shelter tunnel to the southern shaft and up 178 stairs to the surface. The electrical contractors had gone and I found myself locked in! Fortunately I didn't have to wait long before I was missed and someone came back and opened up.

To be perfectly honest, Clapham North is the least interesting of the five shelters I have so far managed to get into as it has been so comprehensively stripped out. But it was still well worth the visit, especially on account of the different access arrangements in the southern shaft.

A new tenant is found at last

There have been numerous attempts to find a new user for the shelter. In 2006 the shelter was offered for lease at a rent of £85,000 a year. A large **To Let** sign appeared on the north entrance wall in Clapham Road advertising 65,000 square feet of underground storage. But despite an enthusiastic national press promotion by the marketing agents Hargreaves Newberry Gyngell, there were no takers.

The problem has always been the lack of lifts with nobody wanting to negotiate 178 steps every time they come in or go out. A few years later there was a fresh attempt by the same agents to lease the tunnels; this time the sign said **Deep-level tunnels to let**.



Co-farmers Steven Dring (left) and Richard Ballard in the trial area on the upper level at Clapham North

The agents' persistence finally paid off in 2012 when two West Country entrepreneurs Richard Ballard and Steven Dring hatched an idea for a carbon-free agricultural venture integrating farming into the urban environment. They planned to use low-energy LED lighting (which is three times more efficient than traditional sodium lighting) and an integrated hydroponics system which uses 70 percent less water than open-field farming.

Next came the search for a suitable location for the urban farm. Warehouses, office blocks and underground spaces were all considered as potential growing areas but while surfing the net they found our Subterranea Britannica website which led them to the Clapham North shelter.

Urban farming underground is a new concept

As TfL was keen to find someone to lease the shelter, the entrepreneurs were given a temporary rent-free lease to see if the tunnels would provide a suitable environment for their scheme. This involved setting up a test area on the upper level close to the Clapham Road shaft.

A test area was set up in December 2012 under the brand name *Growing Underground,* with samples of their herbs and salad leaves being sent to local restaurants including Le Gavroche, owned by two-star Michelin chef Michel Roux Jr who lives in Clapham close to the shelter.

Michel Roux was so impressed with the produce that he visited the shelter. After joining the company in 2013 as a non executive director he said, "When I first met these guys I thought they were absolutely crazy, but when I visited the tunnels and sampled the delicious produce they are already growing down there, I was blown away. The market for this produce is huge."

Zero Carbon Food

After 18 months of trials the company is now planning to expand production and is seeking £1m in funding to bring its produce to London's top restaurants and food stores. They have signed a 25-year lease with TfL; as part of that agreement TfL will pay for a new lift to be

Initial crops will include a range of exotic herbs and shoots, including Pea Shoots, Rocket, Red Amaranth, Mizuna, Broccoli, Garlic Chives, Red Vein Sorrel, Mustard Leaf, Radish, Coriander and Thai Basil which will be sold to restaurants, supermarkets and wholesalers. Edible flowers and miniature vegetables will also be grown. Stage-two crops will include tomato varieties and mushrooms.

The tunnels will provide 2.5 acres of growing space using specially designed structures to house the three-layer growing platforms which are currently being constructed in Yorkshire. The company is planning for the first produce to hit the shelves by late summer this year.

All photos by Nick Catford unless stated

installed in the Clapham Road shaft.

One hundred feet of earth above the tunnels keep temperatures steady at around 16 degrees centigrade all year round and energy consumption at a minimum. Any energy needs will be provided by green suppliers and the proximity of the tunnels to New Covent Garden market and London's many restaurants will keep food miles to a minimum as well. Special filters keep the air in the tunnels free of pests, eliminating the need for pesticides.

A crowdfunding campaign was launched in late January 2014, giving investors of all sizes the chance to buy a stake in the project from as little as £10. Co-farmers (as they now call themselves, rather than directors) Richard Ballard and Steven Dring are confident that investors of all sizes will see a significant return on their investment.

Richard Ballard (left), Michel Roux Jr and Steven Dring.
Photo from Zero Carbon Food

SOURCES Emmerson, Andrew & Beard, Tony. *London's Secret Tubes,* Capital Transport 2004
Zero Carbon food website: www.zerocarbonfood.co.uk
http://growing-underground.com
National Archives File HO205/191-82364

Sub Brit visit to Clapham North deep shelter courtesy of Zero Carbon Food

Tuesday 24 June 2014 at 20.00 (8pm)

This visit is restricted to 12 people.

We will enter the shelter in Clapham Road from where we will descend 178 steps (unfortunately the new lift won't be installed until later in the year).
We will be shown the test area set up by Zero Carbon Food then you will be free to explore the rest of the shelter at your own pace.
We will have two hours in the shelter.

If you would like to attend go to https://my.subbrit.org.uk/ then click 'Register for event'

Winston Churchill and WWII Map Rooms

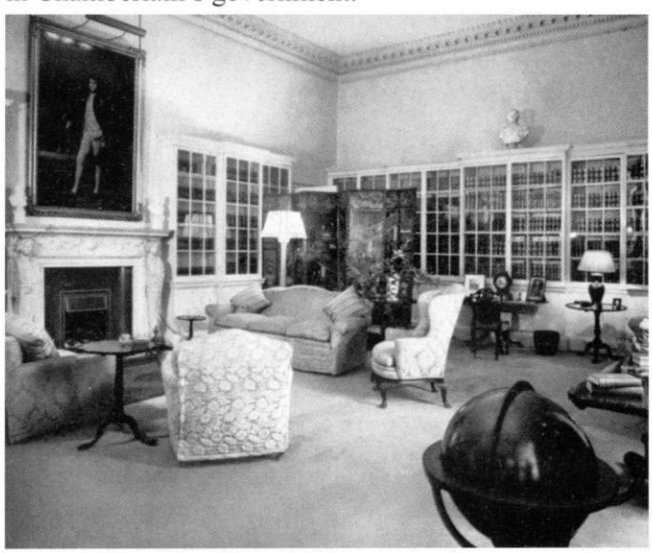
Bob Jenner

With Sub Brit's involvement in Paddock, it is opportune to review the use of below-ground map rooms during World War II. The simplest way to achieve this is to follow Churchill's progress through the war and to relate this to map rooms in use at the time.

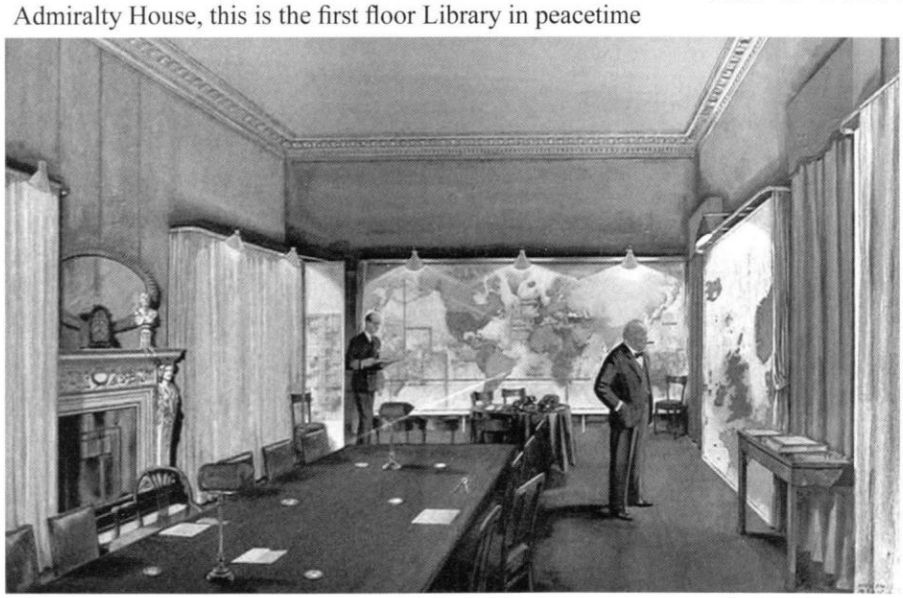
First Lord of the Admiralty

Churchill was no stranger to maps, having been a Cavalry Officer with the 21st Lancers in 1898; First Lord of the Admiralty from October 1911 to May 1915; and a Lieutenant-Colonel, commanding 6th Battalion Royal Scots Fusiliers in 1916.

Before World War II, Churchill was a backbench MP and had no governmental responsibilities – and therefore no hand in the construction or design of the Central (later Cabinet) War Room or its standby at Dollis Hill. On the outbreak of war on 3 September 1939 he was appointed First Lord of the Admiralty for a second time, but now in Chamberlain's government.



Admiralty House, this is the first floor Library in peacetime



This is the same Library, as the original CWR Map Room in the Upper War Room; maps now cover the bookcases. Capt Pim RNVR is in the background behind Churchill. From a painting by Helen Madeleine McKie – National Trust

His official quarters were in Admiralty House, adjoining the Old Admiralty Ripley Building; whilst waiting for his second-floor flat to be prepared he was still living at Morpeth Mansions. He created a replica of the Admiralty's Lower War Room situated in the basement of the Admiralty Extension, and which later formed the lower level of the massive Admiralty Citadel on Horse Guards Parade, on the first floor of Admiralty House.

This 'Upper War Room' occupied the reception room and bedroom; a map room run by Capt Richard Pim RNVR from the Operations Division was also established in the library which had been his office in WWI. A temporary bunk was placed in the dressing room for Churchill's use – this was the first of many occasions where Churchill chose to be accommodated in the room next to the map room.

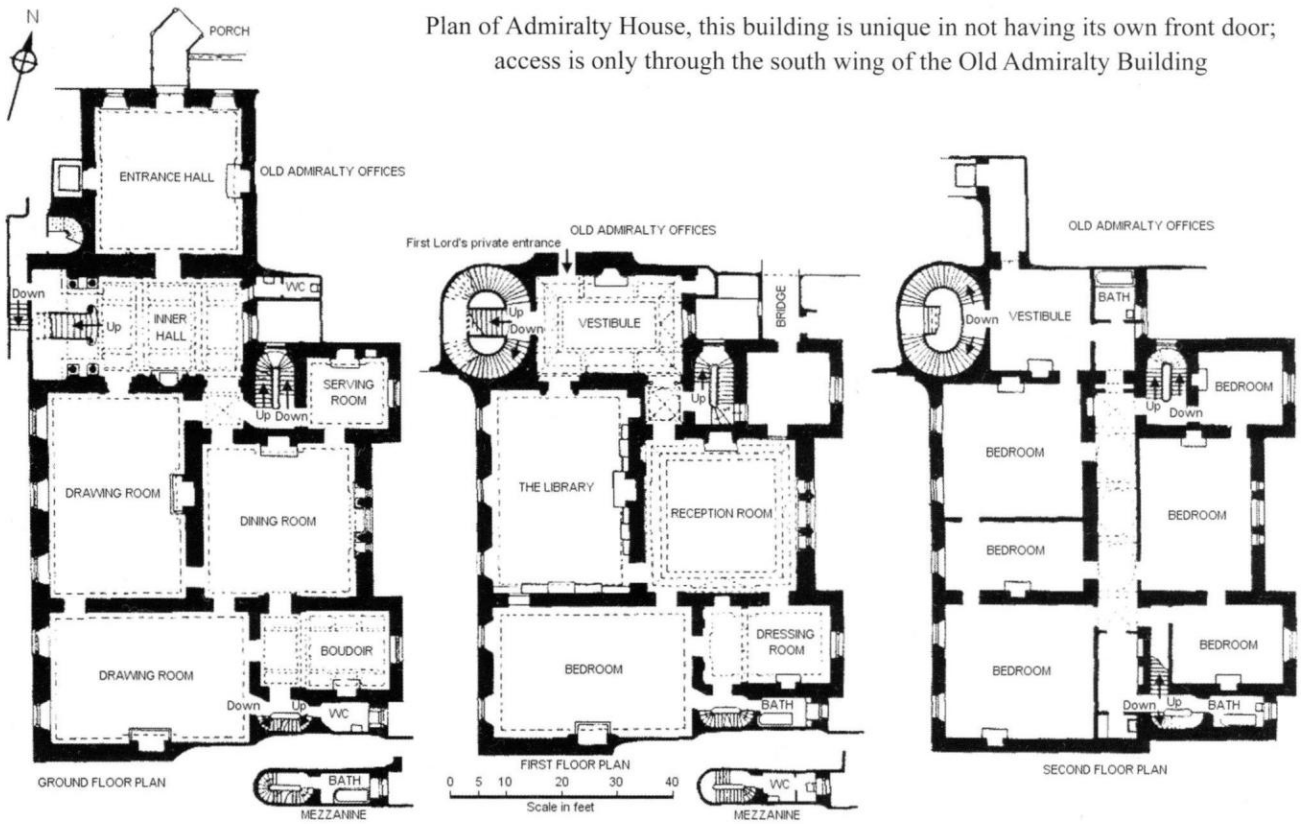
Prime Minister

On 10 May 1940 Churchill became Prime Minister, initially continuing to live at Admiralty House. He then moved to a suite in the Carlton Hotel, Haymarket (the site is now occupied by New Zealand House) while his accommodation at No 10 Downing Street was made ready. On becoming PM, Churchill also had himself created Minister of Defence, an enabling position which allowed personnel and small departments to be attached as his personal staff. For example Commander Thompson RN, Flag Commander to the Board of Admiralty, now became Flag Commander and Personal Assistant to the Minister of Defence and remained with Churchill for the rest of the war. Department MD1 (Ministry of Defence 1) better known as "Winston Churchill's Workshop" was also created. As First Lord of the Treasury as well, Churchill could provide funds for these privately controlled departments.

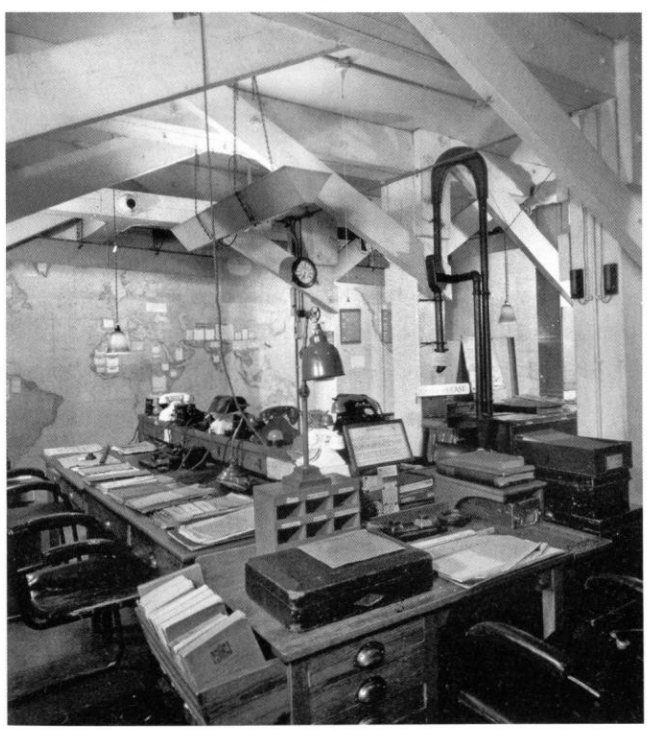
Prior to WWII the Committee for Imperial Defence (CID) had concluded that protected accommodation was required for a "Central War Room" to which was later added a War Cabinet Room. The Office of Works selected the basement of the New Public Offices (NPO) also known variously as Storey's Gate, Great George Street and King Charles Street after the surrounding roads, as being suitable.

Central War Room and satellites

Rooms were allocated at the west end of the basement which was reinforced with timber strutting and supports. Already in the basement were the Air Ministry, Chiefs of Staff, and the CID Secretariat. Pivotal to this war room was the map room where the latest war information was displayed, adjacent to the War Cabinet Room.



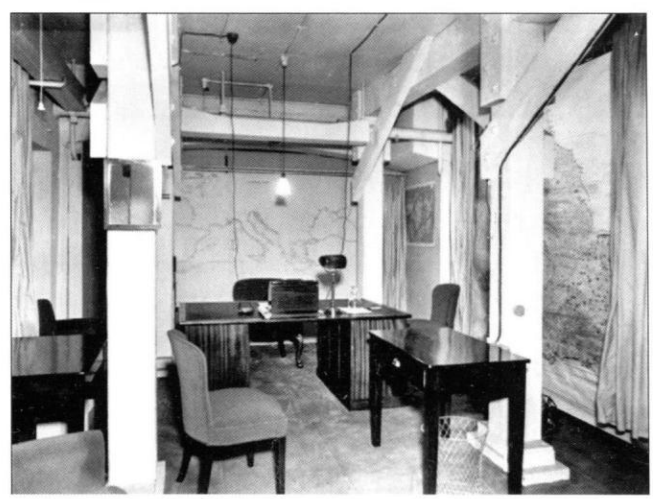
Plan of Admiralty House, this building is unique in not having its own front door; access is only through the south wing of the Old Admiralty Building



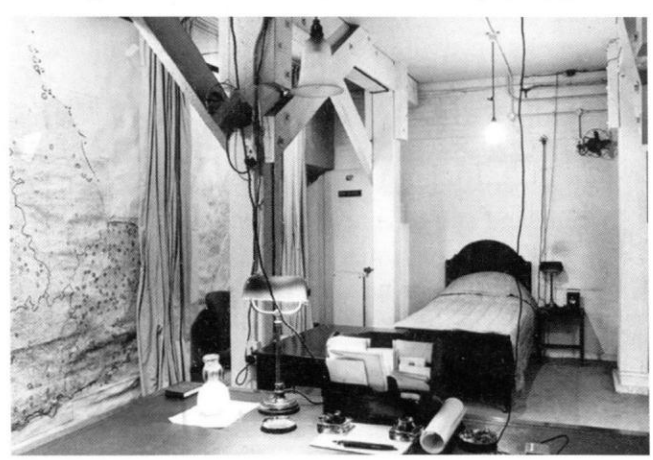
The original, strengthened CWR in the western basement of New Public Offices

The map room was activated by retired senior, service officers and civil servants on 27 August 1939 and remained in operation until 9 August 1945. However, on 27 July 1940, Churchill ousted the War Cabinet from its room to a slightly larger room and took it over as his office and bedroom, which also contained wall maps and displays.

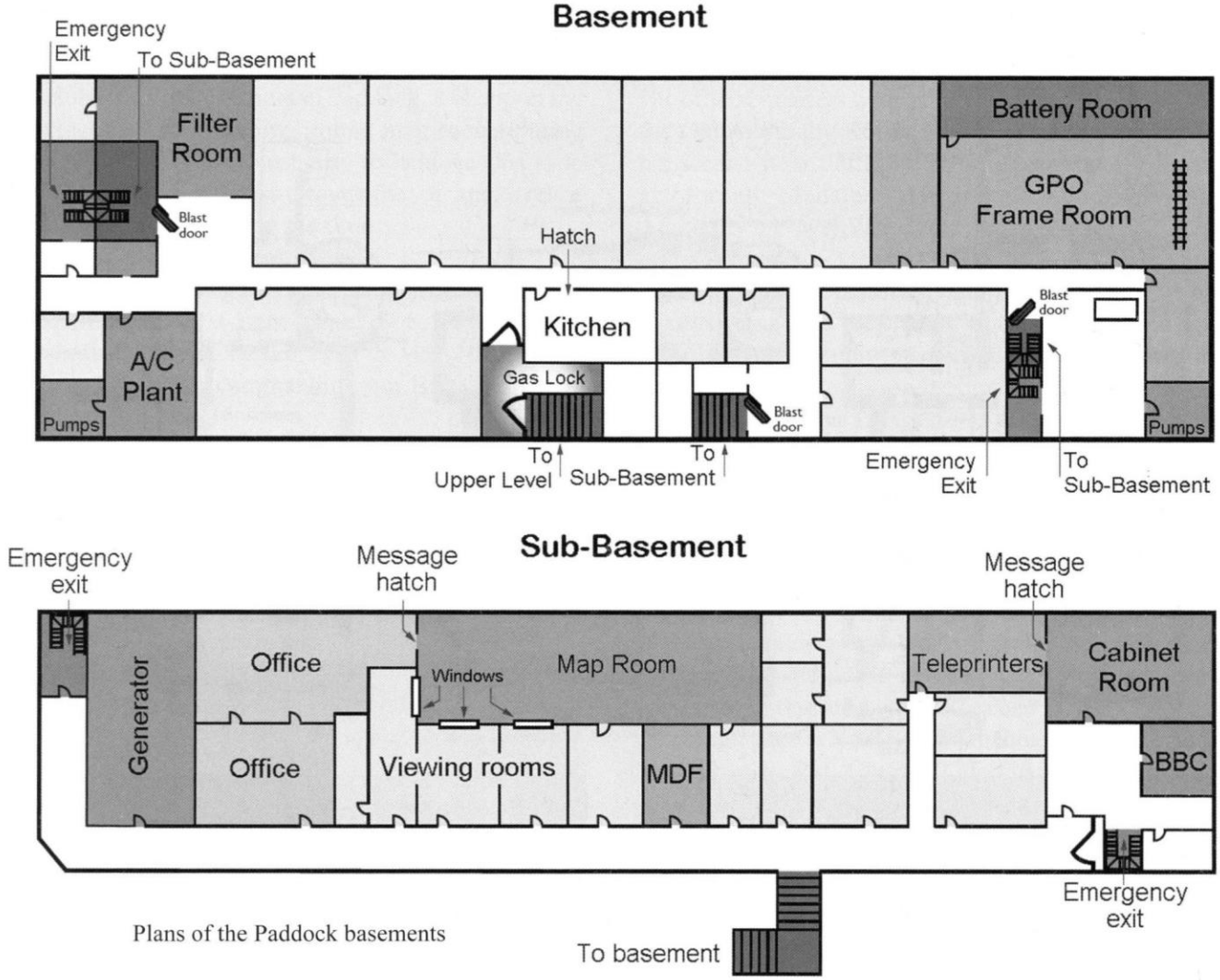
Prior to this, in 1938, before the Cabinet War Room (CWR) was constructed, four other facilities were being



Churchill's bedroom next to the Map Room; this was the original Cabinet Room until relocated by Churchill



The same room as above from the opposite end; Churchill cannot keep away from maps



Plans of the Paddock basements

built, three being heavily protected at Cricklewood (Oxgate) for the Admiralty, Harrow (Station Z) for the Air Ministry and a standby CWR at Dollis Hill, in the grounds of the GPO Research Station. The fourth site was for the War Office and was unprotected at the Royal Military School of Music at Kneller Hall in Twickenham. Later the pre-war basements of what is now the MoD Main Building were converted into a fortress for the War Office. The current MoD Building had been designed before the First World War, which interrupted its construction, as did the financial crisis that followed.

Paddock and the Rotundas

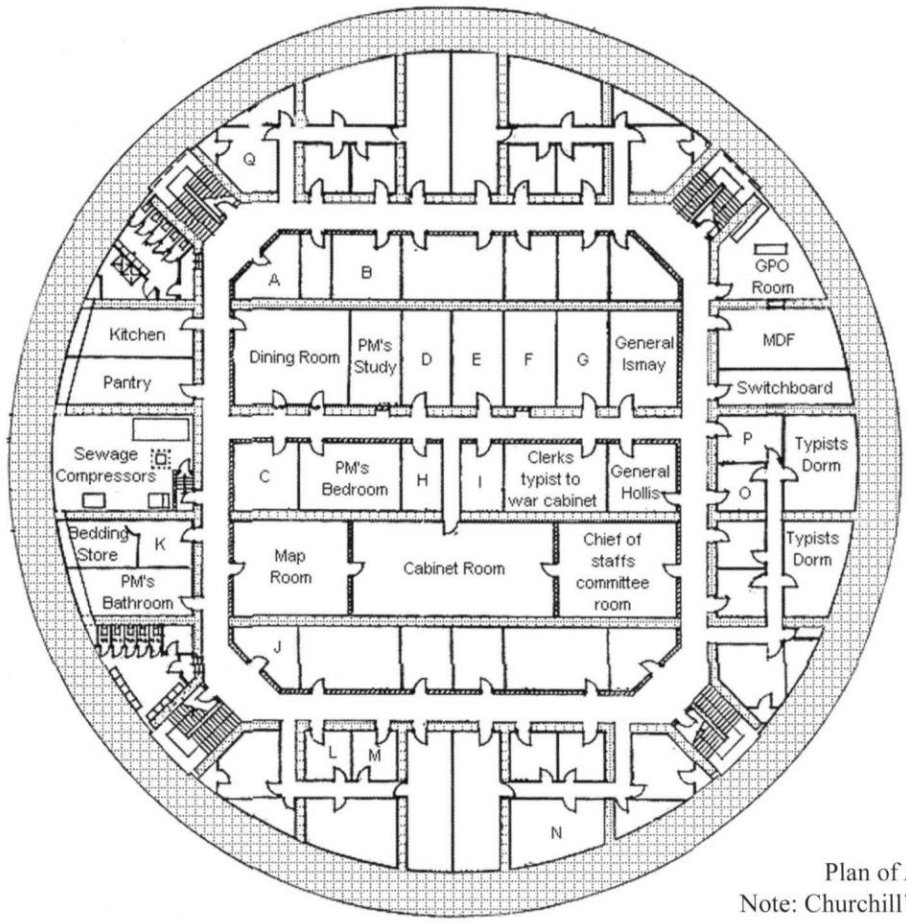
The standby Cabinet War Room (CWR2) at Dollis Hill, codenamed "Paddock", was initially planned to consist of a three-storey block with a protected basement of 18 rooms and sub-basement of 20 rooms containing a Cabinet War Room, a map room and with offices to a similar but narrower plan to that at Oxgate and Station Z. The site would have associated plant and communications equipment. In the event, above ground only the ground floor of 23 rooms was completed.

The complex was ready by late 1940. On 3 October 1940 Churchill held the first of two Cabinet meetings in the sub-basement War Room; he was not impressed and declared it unfit for purpose and therefore not required by

A view of the Paddock surface building, looking to the northwest, the site now occupied by the Network Stadium Housing Association houses in Brook Road

government. A second Cabinet meeting under Clement Atlee was however held there on 10 March 1941 after which the bunker was kept on a care and maintenance basis until 1943.

Two sergeants of the Royal Army Service Corps (RASC) alternated as caretakers of this and the VIP Flat in Anson (see below) until 1943. Paddock was guarded by a detachment of the Corps of Military Police VP (Vulnerable Points) Police – 'Blue Caps' as opposed to

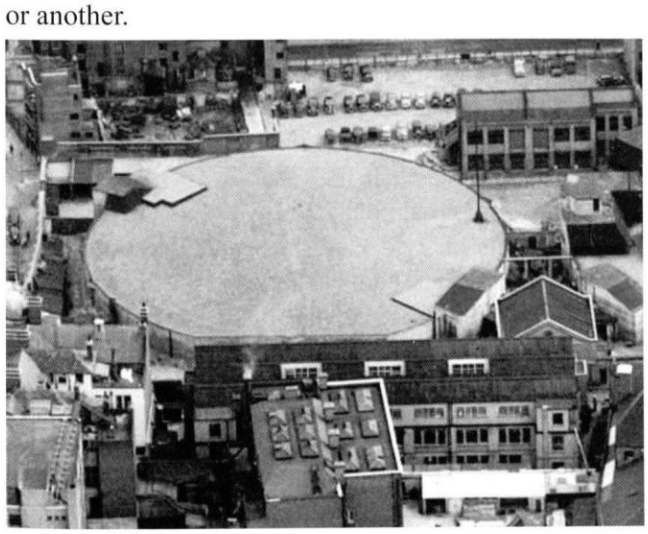


A Messengers
B Colonel Ives - Camp Commandant
C Mrs. Churchill's bedroom
D PM's private secretary
E Secretary to the War Cabinet – Sir Edward Bridges
F Private secretary to Sir Edward Bridges
G Private secretary to General HL Ismay
H Commander C 'Tommy' Thompson RN – PA to Minister of Defence (Churchill)
I PM's personal typist
J PM's private valet
K BBC equipment room
L Maids
M Cook
N Bedroom for secretaries to Sir Edward Bridges and General Ismay
O Private secretary to General Hollis
P PM's typists bedroom
Q Marines

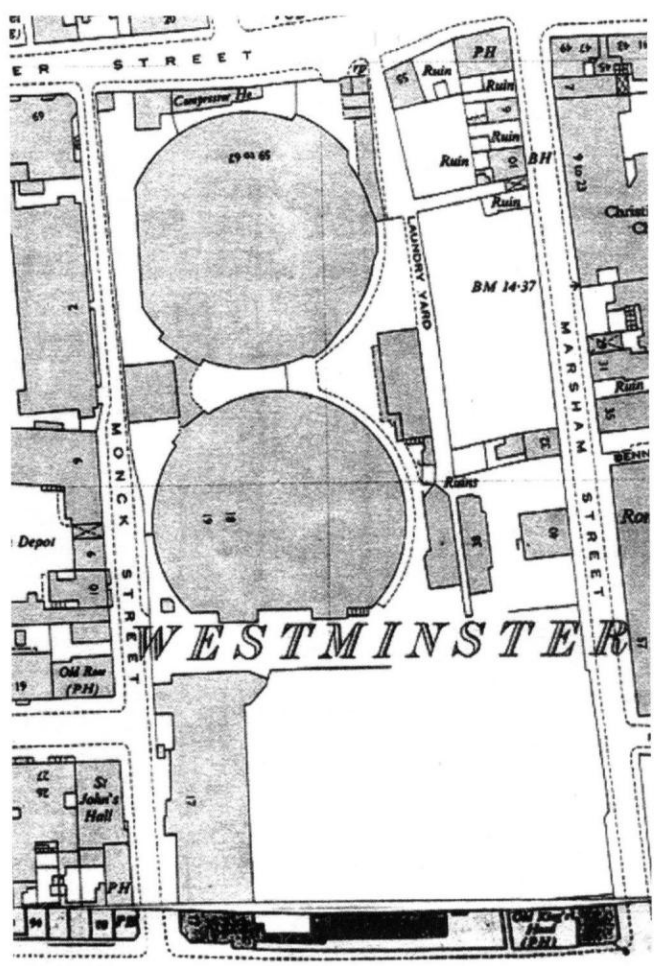
Plan of Anson layout on the lower floor,
Note: Churchill's bedroom is adjacent to the Map Room

the normal 'Red Caps'; a further detachment guarded the larger Dollis Hill site as a separate VP.

In 1940, the Gas, Light and Coke Company's works, in Horseferry Road, Westminster, disused since 1937, saw work commence to convert the site into a heavily protected citadel. Two massive three-storey rotundas were constructed in the two thirty-five-feet-deep gas holder foundations and utilising a reinforced basement of the large office block known as the "Steel Frame Building". Over the course of the war many service and civilian departments occupied this complex at one time or another.



Aerial view of the North Rotunda that housed Anson CWR 3 on the lower floor and later, postwar the Anson Telephone Exchange on the upper floors



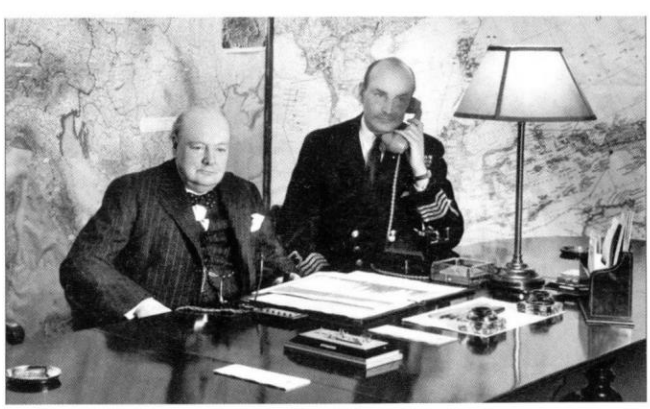
Location of Rotundas and Steel Frame Building

Anson

The rotundas were ready by late 1943, and in anticipation of the Germans' forthcoming V-weapon campaign a small, protected VIP apartment for Churchill was constructed on the lower floor of the north rotunda for use in the event of No 10 Annex becoming untenable. This was later extended into a complete Cabinet War Room (CWR3) code named "Anson", this time with proper accommodation included. To the best of my knowledge this was never activated.

Moving back in time, when Churchill became PM he lived at No 10 Downing Street and normal Cabinet meetings were held in the Cabinet Room there, but following the Battle of Britain and the first days of the Blitz, with near misses and damage to Downing Street, alternative protected accommodation became an urgent requirement. This was established on the ground floor of the NPO, immediately above the CWR, whose name had changed on 27 July 1940 from Central War Room to Cabinet War Room, without altering the initials.

Shows the location of the No 10 annex on the ground floor of New Public Offices on either side of the western entrance. Excluding the window either side of the central entrance the map room was the first two windows to the left. The first four windows to the right were private quarters and the next four were No. 10 annex offices



No 10 annex Map Room, again with Capt Pim, Officer in charge. This Map Room was also known as the Defence Map Room indicating allegiance to Churchill as Minister of Defence rather than the Cabinet

This became known as No 10 Annex and included in addition to a flat for Mr and Mrs Churchill and family, a study/bedroom next to a newly created, personal "Defence Map Room" which was a replica of the Admiralty Upper War Room map room, still under the control of Captain Pim whom the Prime Minister had transferred to his new Ministry of Defence staff.

Map Rooms on the move

So far, Churchill had had the use of five map rooms with adjacent sleeping space, in the Admiralty Upper War Room, Cabinet War Room in NPO, Paddock, No 10 Annex also in NPO and Anson in a Rotunda, but he hadn't finished yet!

Whenever Churchill made an extended foreign trip by sea, Capt Pim and his staff complete with a new mobile map room accompanied him, setting up shop first in RMS *Queen Mary* and then in the Washington DC White House. The U S President subsequently created his own map room after the British model. When Churchill became ill during his flying visit to north Africa and was confined to bed, he immediately had Pim and the mobile map room flown out to him in a specially provided plane.

The map room's function was to provide Churchill, the Cabinet, the Chiefs of Staff and HM the King with the latest information and a daily summary of the previous 24 hours' activities, whilst that of the CWR was to provide protected accommodation. During the 2,075 days from the outbreak of war until VE Day on 8 May 1945, only 115 cabinet meetings were held at CWR1, two at CWR2 Paddock and none at CWR3 Anson. Downing Street continued to be used for its normal function throughout the war, with most of the Cabinet meetings being held there.

It was only during air raids that protective accommodation was sought – indeed, most of Whitehall carried on in the usual manner. Nearly all of the many departments represented in the War Secretariat, Cabinet and Chiefs of Staff occupied the five above-ground floors of the NPO.

Armed forces aside, there were of course many other map rooms in operation in London during the war. The Home Office next door in the then Treasury had one, with a standby in Cornwall House in Waterloo; others were located within the Ministry of Home Security War Room in the Geological Museum, the National Fire Service War Room in Horseferry Road, and the London Fire Brigade HQ on the Embankment. The railways too each had their own regional map rooms as well as a national (Railway Executive) one in Down Street's disused tube station off Piccadilly. The Metropolitan Police had a map room in the basement of New Scotland Yard as did all of the Metropolitan Boroughs. Finally the public utilities also maintained a map room as did the Engineer-in-Chief of the GPO and no doubt others too.

It is interesting to note that in 1940 only 46 persons had access to the Map Room in the Cabinet War Rooms, demonstrating that it was not the focal point that history suggests. Instead it was used to aid taking key decisions and this daily output was more important than the room itself.

Tunnel Warfare – the Chinese concept of active underground shelters

Jérôme et Laurent Triolet

Translated from the French by Stewart Wild

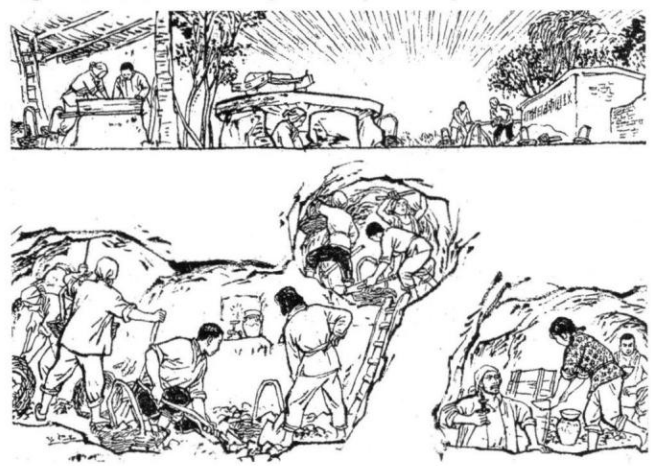
During the Sino-Japanese War (1937–1945), the Chinese people dug tunnels similar to those used later in South Vietnam. In the early 1960s the village of Ranzhuang was the setting for a motivational film entitled *Tunnel Warfare* which promoted the idea of digging and fitting out secret tunnel networks to serve in the struggle of the weak against the powerful. This film, which came out in 1965, at the beginning of the American build-up in Vietnam, became effectively a do-it-yourself manual.

Map of Japanese occupation of China showing area of tunnel networks

In the war against the Japanese, the Chinese peasants organised an underground resistance network that was the forerunner of the successful secret warfare later waged against the French and then the Americans in South Vietnam. Was this part of Chinese military tradition? Maybe not, but certainly there were more and more references to these tunnels known as *dì dào*, or 地道, a word-structure composed of the pictogram 地 (earth) plus 道 (pathway), specifically meaning underground tunnels for warfare.

The Chinese tunnels

Vast networks of tunnels 1 to 1.50 m high and 70 to 80 cm wide were dug beneath many Chinese villages, linking an underground infrastructure of command posts, storerooms, sick bays, canteens, toilets and so on. Entry points were hidden down a well, under a pile of hay, in a firepit, and so on. The tunnels were defended by a range of murderous devices like gun-slits, blind corners, and booby traps, plus a system of doors and barriers to counter the ingress of gas or water. Thousands of Chinese are reported to have been gassed by the Japanese.



Ranzhuang 1942. After the initial Japanese offensive, the Chinese strive to turn their defensive tunnel shelters into active resistance networks

These sites today are found within a radius of about 250km around Beijing, and the two best-known, Ranzhuang in Hebei province (not far from Baoding), and Jiaoxhuanghu north of Beijing, have been open to the public since the early 1960s.

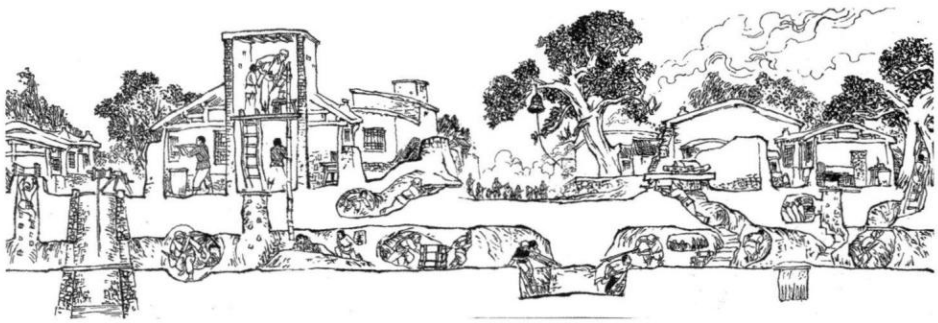
China in the 1980s, relying no doubt on its vast size and peasant masses, had confidence in the *dì dào* tunnels and millions of men and women in people's militias to defend its territory.

There's documentary evidence – magazines, films – of tunnel networks not only below every country village but also under large towns. And after 1945, plans for nuclear shelters were drawn up to be added to this defence against conventional warfare, rather fancifully given the rustic nature of rural China. From 1969 onwards a separate tunnel network linking metro stations was built under Beijing itself, the air-raid shelters becoming known as The Great Underground Wall of Peking.

The film *Tunnel Warfare*

This cinematic icon of socialist realism starts on 1 May 1942 when a dying man arrives at a village devastated by the Japanese carrying a copy of Mao Tse-tung's *Revolutionary War* handbook. Tchao, the party secretary, has instructions to dig tunnels, as instructed by Mao, in order to resist the enemy and fight back.

We see the beginning and development over time of a network that grows as the enemy's attacks increase. We hear the discussions on methods and tactics, sustained by



Ranzhuang 1942–43. As the Japanese mount a second attack, the Chinese gather underground to fight back

Ranzhuang 1942–43. As the Japanese uncover a tunnel entrance, the Chinese defenders fire on them from a hidden guardhouse

readings from Mao's *Revolutionary War* that teach the digging methods and use of this underground defensive labyrinth.

The first part of the film shows men, women and children digging tunnels to join up basements and cellars to make a network. They dig with basic tools and carry the earth away in baskets to scatter on the fields and hide what they're doing from the enemy.

During the first Japanese attack, the villagers, huddled and frightened underground, manage to survive being smoked and flooded out until the aggressors move on. They realise that passive resistance is not enough; they must take the fight to the enemy. Motivated by readings from Mao's *Revolutionary War* manual, they decide that the only long-term solution is to kill as many of the enemy as possible; thus the tunnels must constitute not only a shelter but also an attack base for surface fighting.

As a result the network is enlarged and kitted out with sniper positions, and a drain is cut at the lowest point to disperse any flooding. Communication links are established, both above and below ground, using hollowed-out bamboo and toy telephones made from tin cans and string. The tunnel improvements show their worth when the second Japanese attack is repulsed by an elusive force, and many Japanese are killed before they beat a hasty retreat.

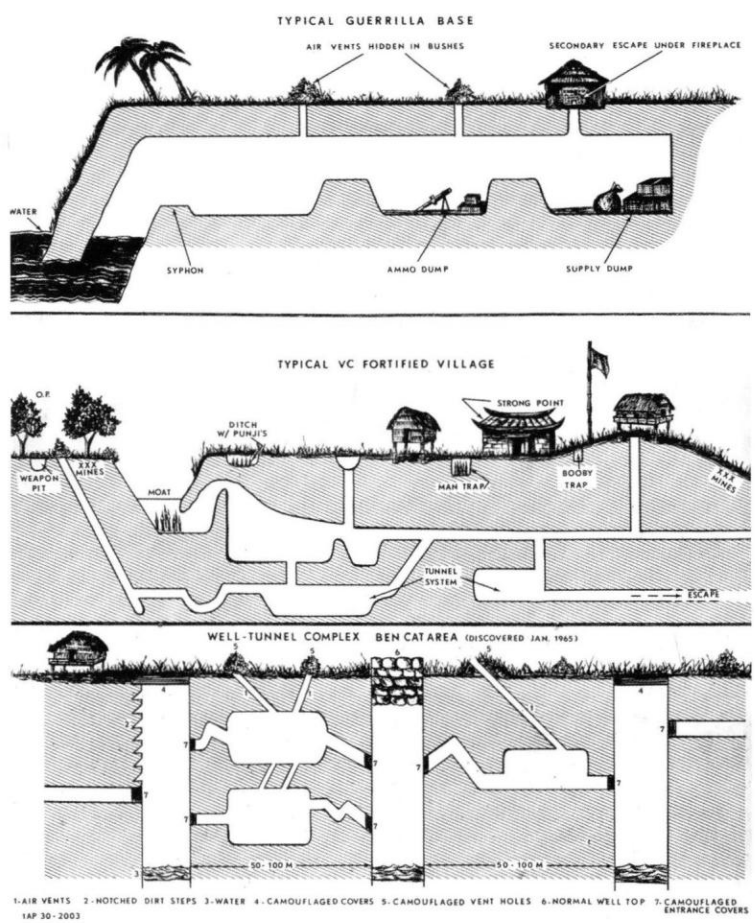
In the last part of the film, time has passed since 1942 and the wheel of fortune has turned. The Japanese have given up attacking Ranzhuang and are increasingly on the defensive; they try to control the territory from their fortified observation towers.

Meanwhile, down below, the Chinese have perfected tunnel warfare with a vast network linking distant villages and enabling surprise attacks on enemy bases that have been undermined.

A training manual for the Vietnamese

In this film, released in 1965 at the start of the American build-up in Vietnam, the parallels are obvious when, for example, district commander Zhao instructs the local Ranzhuang party secretary that he must get his people to "dig tunnels for an underground war... for the Japanese cannot sustain fighting in the long term".

Like many Chinese films of the same period, *Tunnel Warfare* constitutes a training manual for the peasants, and is later revived as a cartoon strip in English (1972) and French (1973). Thus for the Vietnamese communists it's useful for both propaganda and education for the



American army poster from 1966 showing a tunnel network based on one discovered near Ben Cat in January 1965

Perfectly camouflaged trapdoor entrance to tunnel in the forest between Ben Dinh and Cu Chi in South Vietnam

masses, showing them how to dig tunnels and wage war from underground.

The South Vietnamese were not slow to get the message. They constructed huge underground corridors, sometimes on several levels, with semi-buried hides using the natural cover of the forest above. The layout, the size and the linked branches showed how important it was to be able to move quickly from one place to another. While the tunnels were useful as air-raid shelters, their prime function was for avoiding discovery, using stealth to mount counter-attacks, and moving resistance fighters around right under the Americans' noses.

The tunnels that exist today between Ben Dinh and Ben Duoc, some fifteen kilometres apart, are just a small part of a vast network. The amount of excavation in the area around Cu Chi is difficult to believe; here and on the other side of the Saigon river in the 'Iron Triangle' there are reported to be up to 300 kilometres of tunnels where local historians believe that more than 16,000 members of the resistance lived or fought underground.

However, moving on from the history of the Sino-Japanese conflict and the wars in Vietnam, this film about underground tunnel warfare brings to mind simply and brilliantly the construction and purpose of the medieval *souterrains* of western France.

The similar architecture, style and usage of these tunnels separated by 8,000 kilometres and several centuries underlines the whole concept of going underground for shelter and defence. The similarities can only add to our understanding of the French shelters and reinforce our interpretation of them as handy local fortresses.

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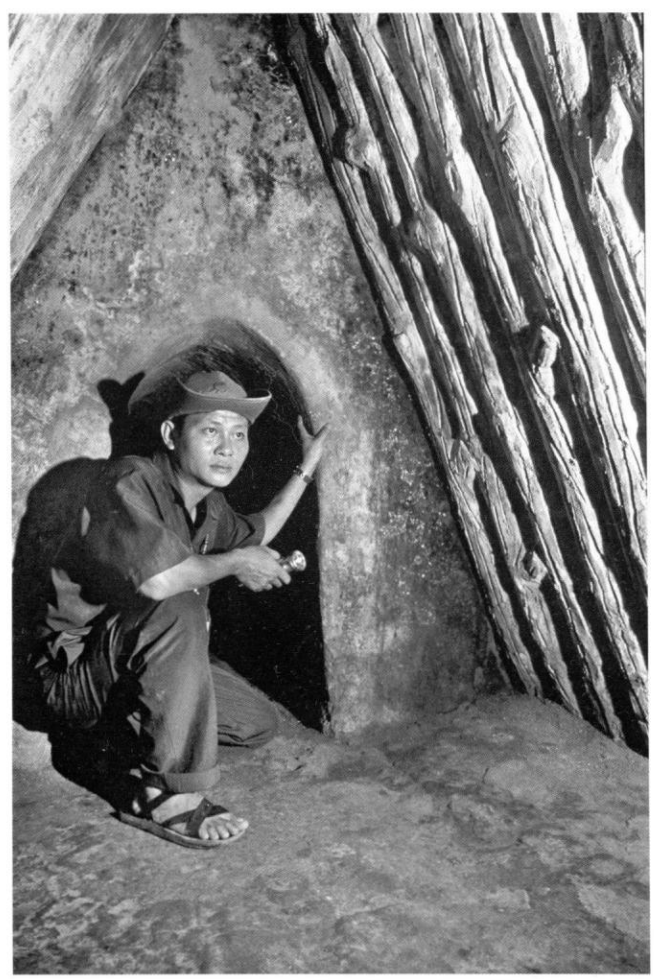
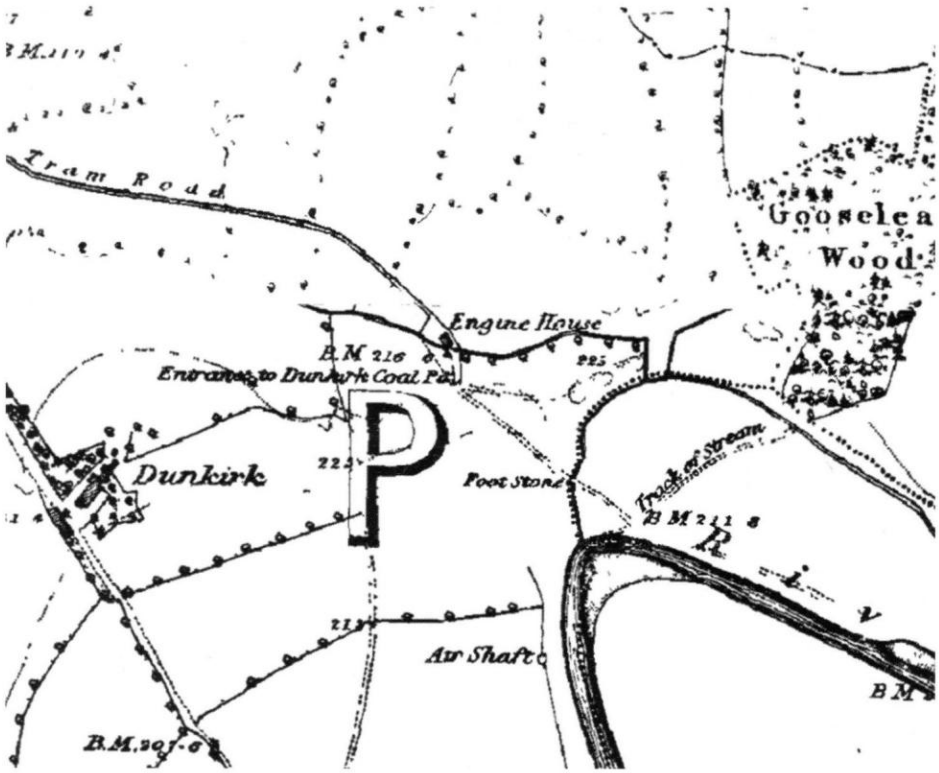


Tunnel air-raid shelter showing walls reinforced with tree trunks, Ben Dinh and Cu Chi tunnels, South Vietnam

Remains of Constant Mary Waterwheel and Haulage System, Dunkirk Colliery, Lancashire

Ken Geddes, Richard Matthews and Brian Jeffrey



1848 1:10,500 OS map showing Dunkirk Pit and the Constant Mary tramway

The Burnley coalfield in Lancashire was extensively worked from the mid-1700s. Many early shafts were sunk by landowners for local needs and were not necessarily named. The last major pits to close were Grimebridge in 1969, Bank Hall in 1971 and Hapton Valley 1981.

There were however some tiny private concerns such as Grimebridge Top Beds which lasted later and one such mine is still working in 2014 with a handful of men. The industry in this area is not well documented, most of the extant literature being personal reminiscences by ex-miners of specific collieries.

The eighteenth century

The Lancashire coalfield in general, of which the Burnley coalfield is an isolated part, was one of the most prolific in England, with several thousand shafts sunk, many of which are undocumented or given the wrong coordinates, bedevilling planning applications for new buildings even today.

There was shaft sinking in the area of Read and Altham from the 1760s, encouraged by the planned original line of the Leeds and Liverpool canal which was intended to cross the River Calder at Whalley on an aqueduct and continue in a northwesterly direction alongside the Calder through Read and Altham to Colne.

However in 1774, with the approach and the foundations for the first pier of the aqueduct partially complete, the company ran out of money due to over-budget expenditure at both ends – and work was stopped. The blockades of the American War of Independence brought severe depression and when funds were finally raised to complete the canal in the better times of the 1790s, the "Cotton and Coal" towns of Blackburn and Burnley were a better prospect – so the canal was rerouted four miles away to the other side of the Calder.

Industrial relics

Most mining sites in Read and Altham are now landscaped and their shafts infilled, capped or simply suspected from depressions in the ground. However there are particularly interesting and significant remains of the Constant Mary haulage waterwheel and drift near Dunkirk Farm at Read (SD764336). These remains were excavated by two local historians, Richard Matthews and Brian Jeffery, who over five years faithfully restored the waterwheel pit and surroundings, without financial assistance.

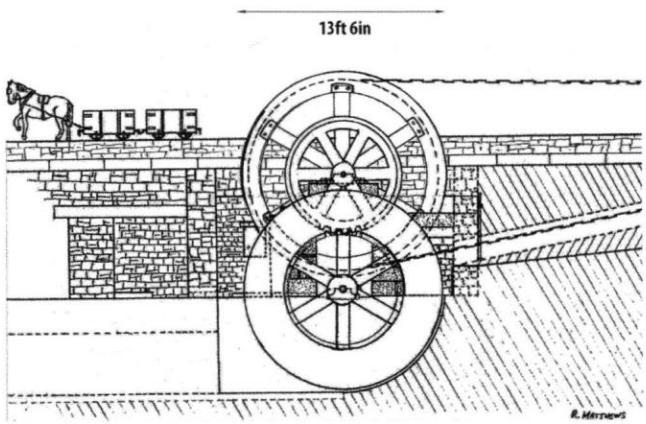
The restored Constant Mary waterwheel pit.

Photo Brian Jeffrey

Mining started on the south side of the River Calder at Altham in the 1760s to work the Arley Seam, the topmost of the three seams, below which were the Upper Mountain and Lower Mountain coals. However a dispute with a neighbouring mine owner about water draining into his pit through a fault led to litigation and caused a major disruption to production. Even when a pumping shaft with an atmospheric engine was installed on the opposite (Read) side of the river, permission was still

not granted to take the coal through the adjacent land. This caused a rethink and a major investment was made – a half-mile drift being driven at a shallow angle to pull the coal out on the Read side of the river. The drift passed under the river and eventually reached 200ft below the surface to the Arley Seam and on the horizon of the bottom of the pump-engine shaft.

It is thought that the technology for the work came from Manchester, rather than the more expected Northeast. It probably came from the school of James Brindley, the engineer and canal builder of the Bridgewater Canal, who brought cheap coal to Manchester from the Duke's mines at Worsley. However Brindley died in 1772, twenty years before the court case about the water finally came to judgement, so the design of the drift would not have come from Brindley himself.



Scale drawing of Constant Mary waterwheel and drum. Drawn by Richard Matthews

Early use of iron wire rope

The unique feature at the time – but later copied at many other mines – was that the tubs were hauled out from the face using an endless hemp rope driven by the waterwheel at the entrance to the drift. They were disconnected at the surface and taken on, without transshipment, by a horse-hauled tramway to the coal staithes. It is interesting that many of the cobbles around the drift entrance are pock-marked from the disconnection of chains on the wagons which were used to wrap round the haulage rope.

The brake rope for the haulage drum was an iron wire rope, part of which has been found. It is believed that the use here was an early example of such a rope (steel wire was not invented until about 1835).

The mill stream for the waterwheel is taken from the River Calder while the tail race flows in a cut-and-cover tunnel alongside the tramroad for a distance, eventually reaching the River Calder again.

Both the wheel and the haulage drum were 12 feet 6 inches in diameter but these were scrapped when the mine finished. The drift portal is obscured by a disused sub-surface water tank which has been put in much later by the farmer and may be removed. The workings themselves are known to be flooded.

A water-balance shaft was used to transport men and materials to the working level. This was probably

Tunnel taking the tramroad through the northern approach embankment of Martholme viaduct. Photo Ken Geddes

operated by the water brought up by the pump engine which found itself back in the mine again – and from where it was pumped out a second time! All the mine water eventually went into the River Calder, only yards away.

Few buildings remain

The sites of the atmospheric beam-engine house, the pumping shaft and a water balance shaft are all close to the river and are on private land and in any case not visible. All that remains is the engine driver's house, still fairly intact with its office, complete with (now) bricked-up windows, a fireplace and bread oven flues. A second room on the ground floor was for the engine driver's family. Lodgings for miners are above. The survival of this building was because of its reuse as a barn.

There is strong evidence of a second track joining the Constant Mary tramroad, close to the outlet of the cut-and-cover tail race from the Constant Mary waterwheel. The 1844 6" OS map shows a wooden bridge over the Calder on its alignment. The tail-race water from the Constant Mary waterwheel goes under this tramroad in a substantial tunnel, perhaps implying that it was still in use when the drift came into use. The track of the combined tramroad runs parallel to the north bank of the Calder but at a higher level.

Engine driver's house. Note the bricked up doors to upper accommodation accessed by ladder. Photo Ken Geddes

Although probably abandoned by the time of the building of the standard-gauge 'Padiham Loop' the tramroad goes through the embankment by a tunnel close by the railway's Martholme Viaduct over the River Calder. The tramroad track bed now terminates at a boundary fence only a few yards before the site of the coal staithes, which were sadly destroyed only a few years ago.

The track bed approaching the staithes still has stone block sleepers in place. The rails were cast iron of L-section and the wagon wheels were flangeless with a 2ft gauge. The staithes were near Cock Bridge and below Cock Wood on the Whalley to Accrington Road (SD 747 342).

It is astonishing that such an important but generally unknown piece of industrial archaeology is still in existence. We are indebted to the research and hard work of Richard and Brian. The waterwheel site is alongside a public footpath and circular walks from Read and Altham can be followed. Richard Matthews and Brian Jeffery are preparing a detailed book on this subject.

The Fern Cave at Matlock Bath, Derbyshire

The Victorian era was characterised, amongst other ways, by the 'fern craze'. The well-heeled owners of substantial detached houses complete with billiard-room, butler's pantry, conservatory, and servants' bedrooms (and bells to summon functionaries from all quarters) had developed an obsession for the non-flowering ferns. Potted ferns were sold in the shops, where more colourful house-plants are now the norm. And the countryside was ransacked, especially for the rarest species (a number of which may now as a result be almost if not quite extinct in Britain).

The Rev. F.H. Arnold, of Sussex, described his search for ferns growing wild at Matlock Bath in or about 1882, with particular reference to the 'Fern Cave' on High Tor.

Steep winding paths from Matlock Bath (near the station) over the top of High Tor and down the other side to Matlock is still in 2012 a splendid if energetic walk, and certainly to be preferred to walking along the A6! The limestone mass and cliffs harbour a stretch of the Derby to Matlock railway line, in tunnels, and a plethora of mine-shafts, worked-out lead mine rakes, and stopes. The river Derwent runs along its foot, 300 feet below its summit.

Arnold, who said Derbyshire was the stronghold of some of the most scarce and beautiful fern species, noted on High Tor 'a conspicuous board' lettered 'To the Fern cave'. This proved to be 'A natural pathway ... formed along the bottom of a deep perpendicular gorge or fissure, caused [he said] by the shrinkage of the limestone'. In some parts 'it is almost dark' and it is so narrow that it admitted 'but one person at a time'. The ferns were growing on the vertical sides of this fissure, inaccessible alike from below or above. He rejoiced in the plants' inaccessibility, as they were thus safeguarded from raiders minded to stock the local shops with plundered wild plants.

This narrow fissure, left by mining-out galena (lead ore) can still be visited, although its notice board has long gone. But the inner end of the fissure, as with a number of other fenced off or gated areas on the Tor, sports a notice warning of the danger of deep shafts. What exactly lies underground here, and historical data for the mines, can of course be discovered at the splendid Peak District Mining Museum in Matlock Bath. There, too, access can be gained to 'Temple Mine' opposite, where short guided tours underground can be enjoyed.

SOURCE: ARNOLD, F.H., 1882, A visit to the fern cave at Matlock. Transactions Chichester and West Sussex Natural History and Microscopical Society 1, 15 – 19.

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